Pit and Quarry
With which is consolidated CEMENT-MILL & QUARRY
Member Audit Bureau of Circulation
Read in Largest Number of Plants

Vol. XXI CHICAGO, OCTOBER 22, 1930 No. 2

Business Conditions Definitely Improved

PITS, QUARRIES, PLANTS GAIN

Proof that business is definitely on the up-grade, particularly in the pit and quarry industries, is indicated by the general tone of reports received from a number of operating plants. The only question that remains is what the speed and vigor of the recovery will be during the rest of the year. Basic industrial activity is on the increase, building has become more active and prices seem definitely to have settled into stability.

For instance, Dow, Jones & Co., in reviewing business prospects on the West Coast this month, says:

"The position of companies producing rock, sand and gravel in Southern California has been materially improved during the past month as a result of upward readjustments of prices to levels which should permit a fair margin of profit.

"An accurate estimate of the percentage increase is difficult, owing to the many various factors involved, but a conservative estimate gives the average increase as in excess of 30 per cent."

Contrasted to the net loss of $554,591 shown by the Consolidated Rock Products Co. of Los Angeles, after bond interest, depreciation and depletion for the first seven months of this year, it is stated by officials that the company has now improved its position to a point where red letter figures are eliminated and a profit is being shown.

Conditions in the south and southeast are definitely improved, according to C. F. Mullen of Chattahoochee, Fla., head of the Florida Gravel Co. Mr. Mullen travels a good deal of the time through this section of the country and is well advised as to general conditions. "A definite upward trend has arrived and, with building construction decidedly increased, I look for a continued, marked improvement," he declares.

The Volunteer Portland Cement Co. plant at Knoxville, Tenn., which had been operating 50 per cent below normal, has stepped up production to almost capacity, according to Chas. F. Lewis, general manager.

"We are turning out 2,600 barrels of cement daily and expect good winter business if bad weather doesn't hamper construction activity more than usual," Mr. Lewis said.

Increased orders for crushed stone and the possibility of a good demand during the winter months have caused the John Evans Lime & Stone Co. of Marion, O., to operate its plant day and night. The night shift was put on late in September. Electric lights were installed to enable the plant to operate 24 hours a day. Daniel Evans, general manager, is of the opinion that business is well on the way to recovery and will continue until full prosperity again reigns.

Will Begin New Cement Plant Within 60 Days

The newly-formed Yazoo Portland Cement Co., of Mississippi, which is preparing to erect a plant near Vicksburg, Miss., has leased a suite of offices in the Merchants' National Bank Building at Vicksburg. Construction will start within 60 days and will be under the supervision of Ralph T. Miller, who designed and built the Hermitage and Cumberland plants in Tennessee.

Glass-Plant Destroyed as Sand Bins Collapse

Officials of the Berkeley Glass Sand Co. were unable to say whether the company would abandon its plant at Berkeley Springs, W. Va., or rebuild, as a result of its destruction when three large sand bins gave way and crushed the plant recently.

The bins, filled with a load estimated to weigh 1,200 tons, crushed the mill and smashed three large power transformers, throwing the towns of Berkeley Springs and Great Cacapon into darkness. The loss to the glass company is estimated at $20,000.

Southern Cement Maker Acquires Gravel Plant

The Powell Lime & Cement Co., Memphis, Tenn., is reported to be planning improvements to the old plant of the Raleigh Sand & Gravel Co., Memphis, which it recently acquired. J. H. Powell is president of the Powell Lime & Cement Co. and R. L. Pemberton is vice-president.

Fire Causes $10,000 Damage in 3 Plants

LOSSES ARE IN MIDDLE WEST

Fire caused approximately $10,000 damage at three plants in the Middle West recently.

The George & Emsweller crushed-stone plant at Orange, near Connersville, Ind., suffered a loss of about $4,500 when fire broke out. An overheated oil-burning engine was blamed by Connersville firemen. The crusher building, several pieces of machinery, and a large quantity of oil were destroyed. The plant office building and tool house were saved, however. The loss was covered by insurance.

The elevator structure at the Ireland & Lester Gravel Co. plant on the St. Joseph river at Benton Harbor, Mich., was damaged to the extent of about $4,000, according to press reports, in a midnight fire. Firemen took to rowboats to fight the blaze and formed a bucket brigade from the river to the scene of the conflagration.

A loss of $1,500 was incurred at the plant of the Keener Sand & Clay Co. near Gallipolis, O., by flames, which originated at the sand dryer used in the plant. Firemen fought the blaze for two hours before it was extinguished. Insurance covered the loss.

Awarded Stone Contract for Arkansas Road Work

Approximately eight and one-half miles of highway between New Boston and Corley, Texas, will be paved with Arkansas lime rock, contract for which was awarded to the Arkansas Lime Products Co., a subsidiary of the Marianna Lime Products Co., according to J. A. Cormier, vice-president.

The rock will be supplied from the company's mines at White Cliffs, Ark.

Ohio Stone Firm Floats Improvement Bond Issue

Bonds totalling $400,000 have been issued by the Blue Ridge Lime & Stone Corp., of Ashford, O., to raise money with which to carry on improvements and the regular quarrying work. The bonds, being first mortgage, ten-year six-percent instrument were bought by the Hanover Bank and Trust Company of New York.

Lime Firm Acquires Abramson-Bode Corp.

McEUEN HEADS NEW CONCERN

The Valley Lime Co., Ltd., has been incorporated under the laws of the state of California and now owns and operates the limestone quarry and property formerly held by the Abramson-Bode Corp. near Lindsay, Cal. A substantial tonnage of lime rock is moving from the quarry now for use in chemical processes in various parts of the state. The company is not burning lime at present but is the wholesale distributor in the San Joaquin Valley for the lime products manufactured by the Diamond Springs Lime Co. at Diamond Springs, Cal.

E. H. McEuen, of Lindsay, Cal., is president and general manager of the new concern, R. L. Rudkin of Tracy, Cal., is vice-president and W. J. Resch of Tracy is secretary-treasurer. The main office of the company is at Lindsay and the quarry and plant are located a few miles southeast of Lindsay with shipping facilities via both the Southern Pacific R. R. and the Santa Fe. All stock is held by the directors and none is being offered to the public. Officials announce that a definite program has been adopted which provides for extensions and increase of capacity as rapidly as the market will justify it.

Fire Destroys Atlanta Plants; $275,000 Loss

Fire of unknown origin caused approximately $275,000 damage on the night of October 1 to six marble plants at Atlanta, Ga.

The plants destroyed were those of the Etowah Monument Co., Commonwealth Marble & Granite Co., National Marble & Granite, Inc., Universal Monument Co., Wholesale Granite Co., and the Berkley Granite Co.

U. S. Gypsum Dismantles Plant at Oakfield, N. Y.

The old mill of the Niagara Gypsum Co. at Oakfield, N. Y., purchased by the United States Gypsum Co. last fall, is being dismantled. Some of the machinery is to be used by the U. S. Gypsum in its present operations.

Texas Cement Makers in Fight on Rate Changes

L. R. Gardner, traffic manager of the Lone Star Cement Co., Texas, and also representing the Trinity Portland Cement Co., San Antonio Portland Cement Co., Southwestern Portland Cement Co., and the Republic Portland Cement Co., testified before H. W. Johnson and Robert Furness, examiners for the Interstate Commerce Commission at Houston, Tex., recently, that any change in the present freight-rate structure as it applies to Houston, Galveston and Texas City, would work to the disadvantage of the cement manufacturers of Texas.

The cement companies of Texas intervened in the case in behalf of Houston, opposing any change in the present rates, or a grouping of the ports.

Crushed-Rock Plant Fed by Tractor and Fresno

An excellent illustration of the use of a tractor and a fresno for feeding a rock-crushing plant is offered in the plant operated by R. Hogg at Oakley, Ida.

Mr. Hogg is furnishing crushed gravel to the Bureau of Highways at several points in southern Idaho which they are using in the construction of oiled roads.

This plant is using a 4½ Good Roads Champion crusher, with screens and conveyors furnished by the Howard-Cooper Corp. The gravel is hauled from the pit by a Monarch 35 tractor and a Perry 1½-cu. yd. fresno. The average haul is about 250 ft. and the Monarch is bringing in about 300 cu. yd. each shift. The tractor could move considerably more, Mr. Hogg states, if it were necessary. The Monarch provides plenty of power for this work and no plowing is required, even in the hardest formations.

Mr. Hogg is well pleased with the operation of his entire plant and says that his Monarch tractor has made a big reduction in his pit costs.

Marble Cliff Quarries Remodeling Stone Plant

Believing that business conditions will steadily be on the upgrade during the coming year, the Marble Cliff Quarries Co. of Columbus, O., is engaged in the expenditure of thousands of dollars in the remodeling of its big crushed-stone plant, known as Plant X, at its quarries near Columbus.

This plant has a daily production of 4000 tons of stone, most of which goes to blast furnaces, chemical works, and for the production of soda ash. From this plant also stone is produced which is used in the burning of lime in the rotary kilns at Marble Cliff, O.

Slag Plant in Alabama Adds Vibrating Screen

The Alabama City, Ala., plant of the Birmingham Slag Co., has installed a new vibrating screen, furnished by the Steward Machine Co., Birmingham.

Engineers Pay Visit to St. Louis Cement Plant

Members of the Engineers' Club of St. Louis went on an inspection tour of the plant of the Missouri Portland Cement Co. one day last month.

Crushed Stone Meet Proceedings Issued

RECORD OF 1930 CONVENTION

The National Crushed Stone Association has just issued the proceedings of the thirteenth annual convention of the association held at the Hotel Gibson, Cincinnati, January 19-22, 1930. Included in this volume are all the papers presented before the convention as well as the various discussions which took place. The record of the session devoted to a discussion of the trade-practice resolutions and the trade-practice conference itself held under the auspices of the Federal Trade Commission on the day following the convention is included.

This publication is a complete and comprehensive history of the meeting, and as such is a necessary and valuable addition to the library of every member of the Association. The value of these papers and addresses is such as to warrant every member ordering a sufficient number of copies so as to place one in the hands of each of its executive officers, salesmen and superintendents. The information contained therein is sufficiently instructive and interesting to be generally broadcast. Copies at $2.00 each may be obtained from J. R. Boyd, Secretary.

Southwest Road Exhibit at Wichita Feb. 24-27

February 24, 25, 26, 27, 1931 are the dates set for the sixth annual Southwest road show and school at Wichita, Kansas.

Each year this event assumes greater proportions and importance than in former years, due, no doubt, to the fact that it has come to be a duly accredited and well established institution from which the public in general and road-building authorities in particular are educated in the latest approved methods of road construction and maintenance.

Nine states had exhibits at the 1930 event as well as the U. S. Bureau of Public Roads, American Association of State Highway Officials, Republic of Mexico, and several colleges and universities. Indications point to a repetition of this for the 1931 school augmented by exhibits from other states, colleges and universities. Valuable lectures and able discussions of road construction and maintenance will be delivered.

Find Bones of Ancient Monster in Marl Pit

While opening a new marl pit near New Richmond, Wis., recently, workmen discovered the well-preserved bones of a huge prehistoric animal, believed to be about 30 ft. long.

The bones have been turned over to state geologists for study.

Southwestern Safety Trophy Is Dedicated

BARBEQUE ATTRACTS 600 GUESTS

The Portland Cement Assn. safety trophy awarded the Victorville, Cal., plant of the Southwestern Portland Cement Co. for going through the year 1929 without a lost-time accident, was dedicated with appropriate ceremonies on Saturday, Sept. 20.

Telegrams were received from F. H. Powell, president of Southwestern, who was unable to be present; J. B. John, chairman of the Association Accident Prevention committee; W. T. Groner, superintendent of the Osborn, O., plant; H. E. Nichols, superintendent of the El Paso plant; F. W. Lafrentz & Co., auditors; Giant Powder Co.; and C. A. Fisher of the Yosemite Portland Cement Co., Merced, Cal.

The principal speaker of the day, A. J. R. Curtis, assistant to general manager of the Portland Cement Assn., gave the dedicatory address, bringing out the manner in which C. Leonardt, the founder of the company, built the plants of this company with the idea of safety and permanence and Mr. Curtis introduced little Nancy Cleveland and Margaret Anthony, who unveiled the trophy.

On behalf of the employees, William Montgomery, of the repair force of the Victorville plant, accepted the trophy and gave a very fine talk. Following him, R. L. Wiley, salesman of the Parker Holladay Co., talked on the subject of mental attitude as it relates to safety work. He proposed the idea that everyone is a salesman and in safety work must of necessity first sell himself completely on the safety idea. Mr. Koffman called upon H. G. Jacobsen, formerly of the Portland Cement Assn., who was the father of the safety trophy idea. Mr. Jacobsen is the man who is entitled to the major portion of the credit in bringing safety to the front in the cement industry. He inaugurated the methods employed by the association in collecting accident statistics. In a few years under his leadership the industry showed a big reduction in accidents and, in 1925, the first plant completed an entire year without a mishap. Mr. Jacobsen is highly regarded throughout the industry and was given a rousing welcome at the Southwestern plant.

A fine barbecue was served to approximately 600 persons at the close of the formal program.

Workman Meets Death in Cave-In at Gravel Pit

A cave-in at the gravel pit of the Republic Creosoting Co., Indianapolis, Ind., resulted in the death of William E. Smith, 38, on September 25. Three other men were carried down by the material, but were not injured. They were L. E. Hess, superintendent; Thomas Schilling and Fred Scott.

Hess and Scott were hurled into seven feet of water in the pit. Schilling was buried partly by the cave-in. Smith evidently struck a piling as he was carried down the embankment. He died in a hospital several hours after the accident.

The four men were standing at the edge of the pit straightening the pilings, when the ground gave way. Hess and Scott swam to safety, and then rescued Smith, who was in a helpless condition. Schilling was able to free himself from the cave-in.

McAvoy to Dispose of Los Angeles Sand Plant

Sale of the sand-and-gravel plant of the Concrete Materials Corp. of Los Angeles, to the Consolidated Rock Co. of Los Angeles, has been consummated, according to Fred M. McAvoy, president and general manager.

Mr. McAvoy, accompanied by Mrs. McAvoy, is contemplating an auto trip up the Pacific Coast before again engaging in business.

Safety trophy dedicated by the Victorville, Cal., plant of the Southwestern Portland Cement Co.

Output of Cement in Iowa to Set Record

HIGHWAY PROGRAM AIDS PLANTS

Due largely to the influence of the $26,000,000 worth of road building to be completed in Iowa this year, the six operating Iowa Portland-cement plants are expected to turn out cement valued at approximately $13,000,000 at the plants.

This amount would be the value of the 8,030,000 bbl. of cement that will be manufactured during the year if the cement plants of the state continue their present rate of production. The six plants in the state are now producing approximately 22,000 bbl. of cement a day.

Mason City has two of the state's cement plants, and Des Moines, Valley Junction, Davenport and Gilmore City, one each. The total capacity of these, estimated at 10,000,000 bbl., has never been reached, this year's predicted production promising to be the highest in the history of the state.

The cement industry in Iowa, ranked as the eleventh industry in the state, this year is employing between 1,400 and 1,500 men. The annual payroll of the six plants is reported to approximate $2,000,000. The plants themselves represent a total capital investment of almost $16,000,000, figures show.

The production of cement in Iowa has grown steadily with the development of Iowa's paved-road system, with the exception of 1924 and 1925. In 1921 the production was 4,151,000 bbl., slightly more than half of the output predicted for this year.

In 1922 production went up to 4,450,000 bbl. and in 1923, due to the opening of the Valley Junction plant, it went up to 5,500,000 bbl. The next year production was reduced about 700,000 bbl., and in 1925 it remained slightly under but close to that figure.

Production figures advanced slowly in 1926 and in 1927 the total was up to 5,415,144 bbl. In 1928, the last year for which accurate figures are available, the state produced 7,070,172 bbl. of cement. It is estimated that figures for 1929 were slightly above this figure, but as yet there is no verification of this fact.

Following are figures showing cement production in Iowa: Plants in operation, six; plants not in operation, one; men employed, 1,400 to 1,500; annual payroll, $1,900,000; output daily, 22,000 bbl.; daily capacity output, 26,000 bbl.; estimated output for 1930, 8,030,000 bbl.; estimated value at plants for 1930, $13,000,000; coal used annually, 562,000 tons; raw material used annually, 2,409,000 tons; and capital investment, $16,000,000.

U. S. Gypsum Erects Nova Scotia Plant

IN CANADA AS MANUFACTURER

The entry of United States Gypsum Co. into the Canadian field as a manufacturer is seen in the construction of a new plant at Hillsborough, Nova Scotia. The plant, according to a Canadian commercial journal, is conveniently placed to use the high-grade gypsum in the hills not far from the shore of the Petitcodiac River, an arm of the Bay of Fundy, and to put its products directly into ships for export. It is apparently the intention of this company to get a share of the rapidly increasing Canadian export trade in gypsum products before it builds any inland plants.

The United States Gypsum Co. is by no means a newcomer in Canada. For over twenty years it has been engaged, through its subsidiary, the Canadian Gypsum Co., in quarrying gypsum in Nova Scotia and shipping it in the crude state for treatment in its various mills in eastern United States. Its steamers, *Gypsum King*, *Gypsum Queen* and *Gypsum Prince*, are well known on the Bay of Fundy. Last year these vessels carried close to a million tons of Nova Scotian gypsum to the mills in the United States.

While American tariff regulations virtually prohibit the manufacture in Canada of gypsum intended for use in the United States, this does not apply equally to other countries that can be reached economically from the ports of the Maritime Provinces.

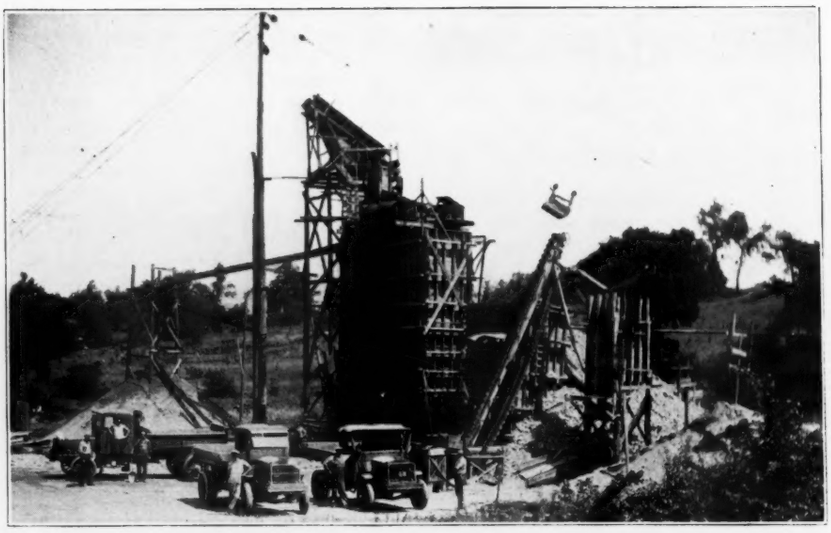
British Columbia Gypsum Deposits to Be Worked

Gypsum deposits at Island Point, British Columbia, which were the subject of much legislation some years ago, are soon to be developed by Gypsum, Lime & Alabastine, Ltd., of Montreal, Can. Expectations are that shipments will start next summer. Preparations are now being made for the installation of machinery.

Old River Bed Supplies Gravel for Davis Plant

An excellent deposit of sand and gravel has been opened at Crawfordsville, Ind., this year by D. A. Davis, well-known Indiana road contractor. The pit is located in a former river bed and is exceptionally suitable for slack-line cableway production. A small creek flows continually into the pit which has no outlet. It is believed that the water is carried below the surface of the earth forming numerous springs and outlets about a mile away.

The Davis plant consists of a 1¼-cu. yd. slack-line cableway, the bucket of which was designed and built by Mr. Davis himself. One rotary classifying screen and a Universal crusher are used at present for processing the material. Future expansion will include the installation of a vibrating screen. The plant at present has a maximum capacity of 500 cu. yd. of material per day, the bulk of which is shipped by truck direct to road construction jobs.



Plant of D. A. Davis Co. after first year of operation.

Engineering Graphic Is of Interest to Industry

Several feature articles appearing in the second edition of Engineering Graphic will be of interest to men of the pit and quarry industry. Published as a quarterly bulletin by the advertising department of the Sullivan Machinery Co., Chicago, Ill., this magazine has aroused the attention of engineers and plant operators interested in the design and application of compressed-air machinery.

An article entitled "Aerated Cement Flows Through Pipes at Modern Plants" discusses one of the newer methods of handling cement in which the pulverized materials are aerated by means of jets of compressed air to render them fluent and in a condition to be pumped similarly to pressure pumping of liquids. Several photographs are included illustrating the method as employed at the Lawrence Portland Cement Co., Thomaston, Me.

Several other articles dealing with the application of air compressors in mining enterprises in various parts of the world complete the issue which consists of 33 pages.

Improvements at Memphis Plant Near Completion

Work on two 60-ft. silos, sand and rock bins and elevators of the Marquette Cement Mfg. Co. at Memphis, Tenn., foot of Poplar av., is being rushed to completion and will be finished by Nov. 1, according to the Gauger-Korsmo Construction Co., which has the general contract.

Work started two months ago. When improvements to the plant are completed, the total amount spent will be $300,000.

Architects are now drawing plans for a larger central mixing plant, of reinforced-concrete construction, to provide the building trade with both wet and dry-batched mixtures.

In addition four new barges costing $50,000 each will be purchased. When improvements are completed, the total amount spent will be $300,000. The barges will join the fleet of two towboats and four barges now operating between the plant at Cape Girardeau, Mo., and Memphis.

Builds Sand-and-Gravel Plant near Columbia, S. C.

The Carolina Gravel Corp. of Columbia, S. C., is constructing a 2,000-ton sand-and-gravel plant at Camden, S. C. The plant is located on the Seaboard R. R. and is to be electrically operated throughout, with the exception of a dragline, which will be Diesel powered, and gasoline locomotives, according to G. E. Walker, president. Vibrating screens are to be used for sizing all material. Construction began early this month.

The company also plans later to develop deposits which it holds under lease at Hagood, Cayce and Horatio, South Carolina.

Ohio Material Concern Installs $20,000 Plant

The Peter Milliron Sand & Gravel Co., of East Liverpool, O., has installed a $20,000 plant for handling coal, sand, gravel, brick, cement and other builders' supplies along the river front between Union and Washington street.

The plant includes docks for the mooring of river barges, a gasoline-operated crane, railroad switch and other facilities. Shipments of sand, gravel and coal, received by barge, are loaded into trucks or railroad cars by means of the gasoline crane.

New Studies Planned by Cement Committee

2-YEAR PROGRAM MAPPED OUT

At a recent meeting in Washington, D. C., Committee C-1 on Cement of the American Society for Testing Materials effected a reorganization and prepared a preliminary program of work for the coming two years.

During the past year the Committee submitted to the Society a tentative specification for high early strength Portland cement and an upward revision of the standards for Portland cement. Both of those have been adopted and are in effect.

With this new tentative standard and the revised standard in force, the committee believes that the opportunity is ripe for rather more fundamental and detailed studies of those two most widely used hydraulic cements, and of the masonry or plastic cements, whose use is growing so rapidly, than was possible with the organization under which the committee had functioned for so many years. A letter ballot almost unanimously approved a reorganization along certain suggested lines. The meeting referred to was to carry into effect these approved suggestions.

The outstanding feature of the new plan of committee operation places the investigations of each type of cement and the preparation of a standard under a separate subcommittee. For the present, therefore, there will be a subcommittee on standard Portland cement, one on masonry cement, and one on all high early strength cements—both of the regular Portland and high-alumina types. Another subcommittee will have the duty of preparing the standards for methods of test. This is essential, since the Society will issue the methods of test as separate publications from the physical and chemical requirements, for all hydraulic cements. This subcommittee will not indicate to the other subcommittees what methods they should use, but rather will help the other subcommittees develop and refine the methods they think are needed to indicate the desired requirements, and further make as uniform and co-ordinated as possible the testing methods for all hydraulic cements.

In planning future work, the committee believed it desirable to throw off the shackles of precedent and past history. With two new standards just in effect, there is time at hand to make extensive studies of the sometimes considered radical new test methods suggested by progressive users and producers. It was not believed desirable to study any method or requirement simply because it was one of long-standing. Rather studies should be made of those requirements which are believed to be indicative of a needed property in the cement. Further, a needed property would be considered one which would indicate the deportment of the cement in use over a long period of time or under possible adverse conditions rather than that one which would indicate laboratory differences in cements.

The total membership of the committee is limited to seventy-five, in order to lessen the danger of its becoming slow, unwieldy, and inefficient, but it welcomes at all times, and especially now when the subcommittes are developing new programs of investigational work, suggestions from all those interested in the testing and using of cement. Comments as to the types of tests which should be studied, data indicating the adequacy or inadequacy of present methods, suggestions as to specific requirements, and, in fact, anything that an interested party would consider of value to the committee, is welcomed.

To complete the reorganization required by the new by-laws, the election of the officers made at the June meeting was confirmed. The committee will continue under the chairmanship of P. H. Bates, Bureau of Standards, Washington, D. C.; secretary, F. H. Jackson, U. S. Bureau of Public Roads, Washington, D. C.; and A. C. Tagge, Canada Cement Co., Ltd.; Montreal, and R. B. Young, Hydro-Electric Power Commission of Ontario, Toronto, as vice-chairmen.

Industrial Exposition at Cleveland in April

Announcement is made of the Second National Industrial Equipment Exposition to be held in Cleveland, April 13-18, 1931. The exposition will cover materials-handling equipment in its broadest sense including overhead, floor and underground conveyors, also trucks, tractors, cranes, hoists, and the varied equipment used in the industrial handling of materials and supplies in factories. The exposition will utilize the entire arena and exhibition hall of the public auditorium.

During the same week will be held the fourth National Materials Handling meeting of the American Society of Mechanical Engineers, as well as the Second Industrial Congress on Management, Maintenance and Materials Handling, which will be sponsored by the management division of the A. S. M. E., The Society of Industrial Engineers, and other national groups interested in progress in factory betterment. Over 25,000 members of these Societies will give the Congress broad possibilities for wide dissemination of knowledge in these fields.

With the meetings and papers being planned, foremost authorities in these fields will be asked to participate. It is apparent that the week will be an outstanding one as portraying present operations and future applications of the principles of management, maintenance and production, including equipment and services in connection with materials handling.

Fuller's Earth Plant Is Nearly Completed

FLORIDA MILL COSTING $100,000

Satisfactory progress is being made on the erection of the new Fuller's earth treatment plant of the Superior Earth Co., at Emathla, Fla., according to advice from officials. The plant, located near the mine, will cost over $100,000 when complete.

Finishing touches are now being given to the concrete foundations, which will be completed by the end of this month. The steel construction, which has been carried on simultaneously with the foundation work is also well advanced, and the entire plant will soon be under roof.

Installation of the machinery, all of which is of the newest type, is to start shortly, and the new plant will be ready for operation by the end of the year.

The plant will be electrically operated throughout, and will automatically grade the raw earth being treated, making it possible for the company to supply several grades of earth as desired, instead of only one, as was the case with the old plant. The new unit will have a daily capacity of 150 tons of earth. This is about double its former capacity. Regular employment will be given approximately to 25 men.

The fuller's earth deposit at Emathla is said to be one of the largest in the United States and of high purity. The company owning and operating it is headed by C. C. Rupprecht and associated with him in the management of the plant is L. R. Cameron.

Louisiana Gravel Plant Named "Belle Cheney"

A new sand-and-gravel plant recently placed in operation near Turkey Creek, La., by Gifford-Hill & Co., has been given the name Belle Cheney. New equipment has been installed, including a 36-ft. by 40-ft. dredge boat, equipped with a 10-in. gravel pump and a 250-hp. Fairbanks-Morse Diesel engine. The boat pumps direct to a screening plant which turns out gravel from ¼-in. to 2 in.

Gifford-Hill & Co. operates five other plants in Louisiana and Texas.

Move Seattle Office of Portland Cement Assn.

The Seattle, Wash., district office of the Portland Cement Assn., has been moved to Room 518, Exchange Bldg. The office, formerly located in the Seaboard Bldg., is in charge of Frank Barrett, manager of that district which embraces all of Washington and Northern Idaho. Ten field engineers, operating under Mr. Barrett, take care of the association's work and promotion in that area.

Employs Air Separation to Reduce Power Costs in Finish-Grinding Mill

New Unit at Missouri Portland Cement Co. Follows Ideas of Vice-President Norcross

SEVERAL years ago the Missouri Portland Cement Co. put into operation a new plant for the production of Prestolith Velo quick-hardening cement. This was not the first plant to produce this type of cement, but it was the first new plant built specifically for its production. This plant can produce also standard Portland cement.

The company demonstrated again its foresight and willingness to pioneer in new developments when it put into operation a new finish-grinding mill in its old Red Ring plant, at St. Louis, which utilizes, to the greatest possible extent, the advantages of air separation. At the instigation of Hiram Norcross, vice-president and general manager, the new mill was designed by the company under E. M. Stevens, chief engineer, in co-operation with the Allis-Chalmers Mfg. Co. Construction was begun Jan. 15 and the mill went into full operation June 15, 1930.

As other changes are to be made to the plant in the near future, the clinker- and gypsum-handling systems to the new mill building are temporary. Gypsum is unloaded from cars, by locomotive crane, to a small steel hopper. This feeds an inclined belt conveyor to the mill. Clinker is fed from storage, by a bucket elevator, to another inclined conveyor. Both the clinker and the gypsum conveyors discharge to a third inclined belt conveyor which discharges to two elevators leading to the mill-feed bins.

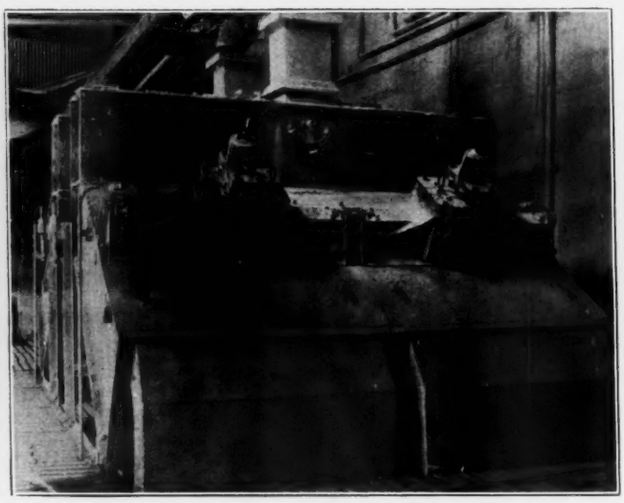
The two 20-in. concrete-inclosed, chain-bucket elevators operate on 56-ft. centers, and are driven by Westinghouse 30-hp. motors through Falk spur-gear speed reducers. Each elevator feeds to one gypsum bin and one clinker bin. Each of the two clinker bins has a capacity of 3,800 bbl. so that no loading is necessary at night. Each gypsum bin holds 222 tons of gypsum, sufficient for several days' operation. The bins are of steel construction and, together with the building framework, were fabricated and erected by the Mississippi Valley Structural Steel Co.

Each pair of bins discharges to a pair of Schaffer 20-in. Poidometers, one pair feeding each of the two grinding mills. Each of the Poidometers is driven by a Westinghouse 3-hp. d.c. motor through a Gears and Forgings, Inc., speed reducer. An individual rheostat for each motor allows the proportions of clinker and gypsum to be altered at will, while a master rheostat for each pair of Poidometers controls the quantity of feed. There is a motor-generator set for these motors.

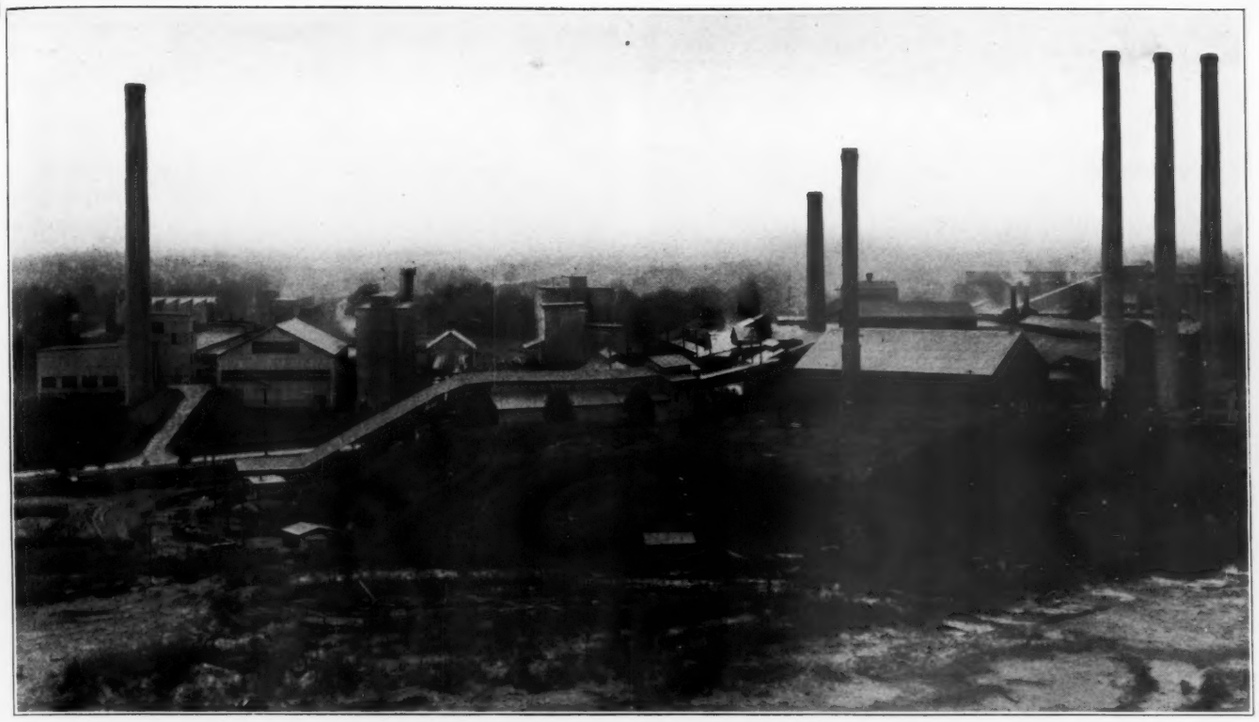
The two finish-grinding mills are Allis-Chalmers 9½-ft. by 8-ft. by 40-ft. four-compartment Compeb mills. Each of these mills is connected up to two Sturtevant 16-ft. air separators, as will be described. This is believed to be the first installation in which a 4-compartment mill has been used with two separators. An Allis-Chalmers 47-hp. 30-kw. generating set furnishes excitation for each of the mill motors.

The mixture of clinker and gypsum is fed by the Poidometers to the first compartment of each mill. The ground material runs from this compartment through a slotted end grate and a series of round holes in the shell of the mill into a stationary mill dust shell supported on a concrete foundation. The material drops from this shell into a 16-in. screw conveyor to a 20-in. concrete inclosed elevator on 55-ft. centers. This discharges to the first Sturtevant

Complete installation of vibrating screens in the raw mill building.



Close-up of two vibrating screens in the raw-grinding building.

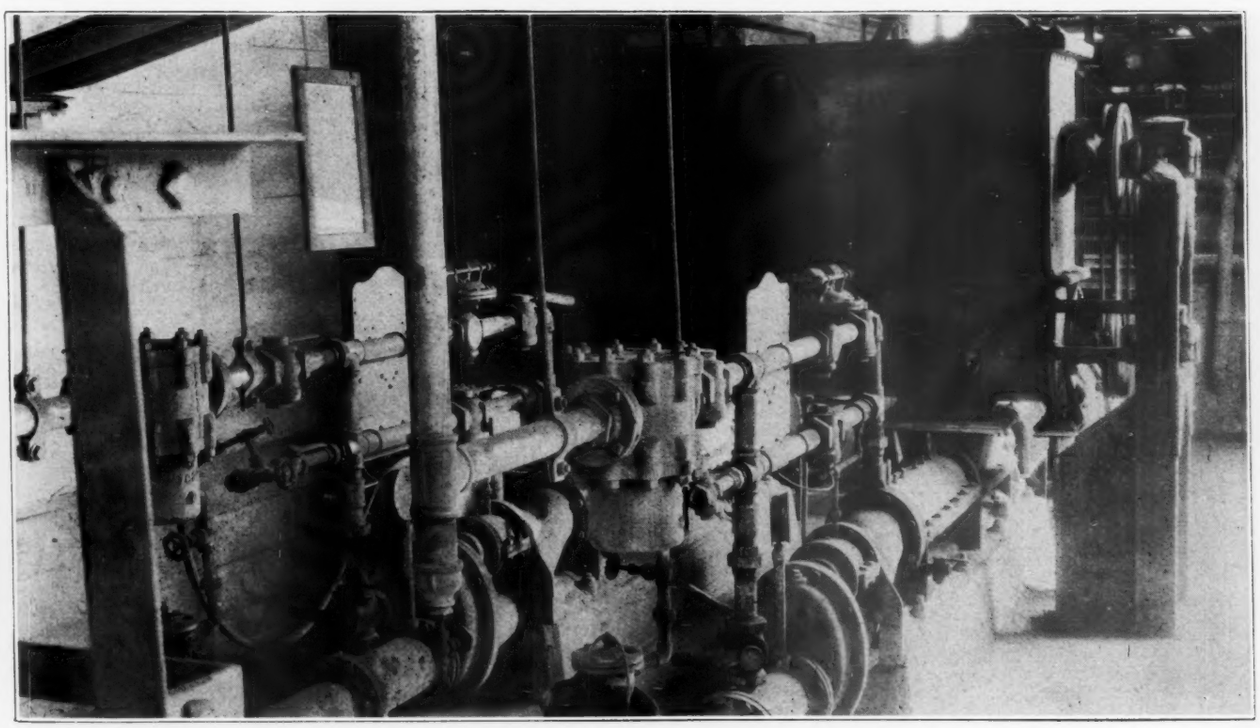


General view of both plants of Missouri Portland Cement Co. with the new building in center background.

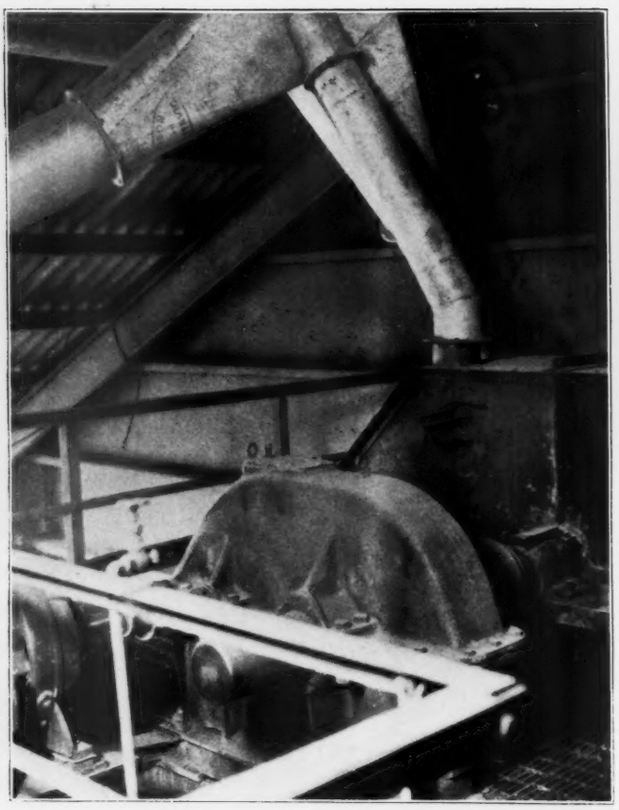
16-ft. air separator. Each separator is belt-driven by a Westinghouse 40-hp. motor at the rate of 175 r.p.m.

The tailings from the first separator discharge through the side into the dust casing between the first and second mill compartments. These tailings are picked up by scoops attached to the mill shell and fed to the second compartment. The fines from the first separator discharge through the bottom of the separator into the dust casing between the third and fourth compartments of the mill, scoops feeding into the latter.

The material discharged from the second compartment of the mill goes to a similar screw conveyor and elevator to the second Sturtevant 16-ft. air separator. The tailings from this go to the third compartment, and the fines to the fourth compartment of the mill. This is the customary method;



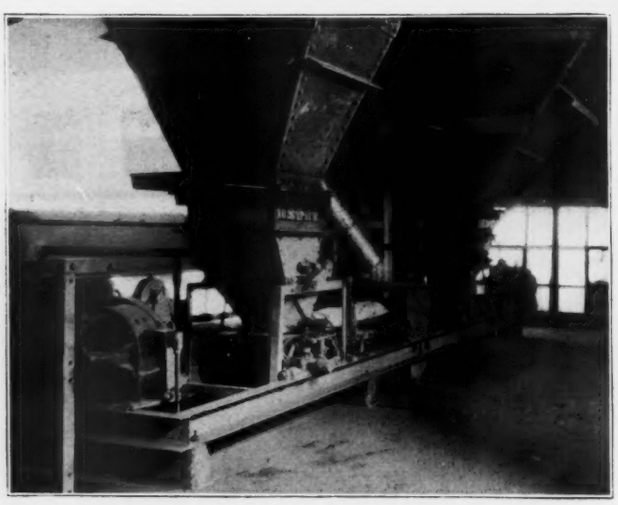
Cement pumps and devices for removing moisture from the compressed air. Cement feeding bins in rear.



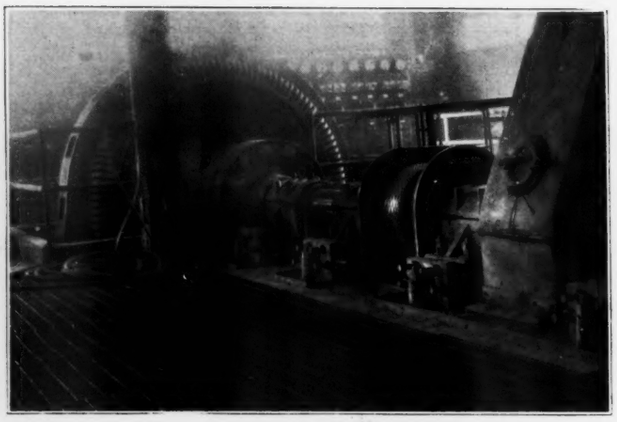
Speed-reduction drive for elevator to the air separator. Note the enlarged joint in the dust-collector pipe.

but, if a variation in the product is desired, the fines from the first separator can be fed to the elevator to the second separator instead of to the second compartment of the mill, by turning a valve. Otherwise, the flow is identical.

Each of the four elevators to the air separators is driven by a Westinghouse 30-hp. motor through a Falk speed reducer, while the screw conveyors feeding the separators are chain-driven from their head pulleys. The screw conveyors feeding the elevators are driven by Westinghouse 5-hp. motors through De Laval worm-gear speed reducers.



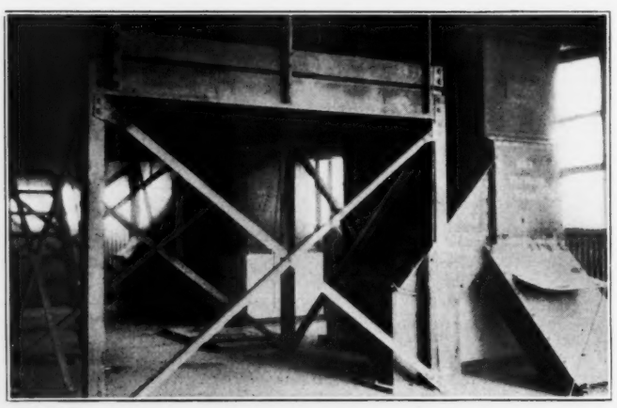
One set of the automatic weighers of gypsum and clinker as fed to the grinding mills.



The drive for one of the finish mills.

Each mill is driven by an Allis-Chalmers 1,000-hp. synchronous motor through a direct-gear drive at a speed of 18½ r.p.m. The first compartment of each mill is loaded with 4-in. maximum steel balls, while the last three compartments use Allis-Chalmers 1¼-in., ⅞-in., and ¾-in. Concavex respectively.

The mills discharge the finished cement to the two ends of a 16-in. right- and left-hand screw conveyor which feeds, at its center, to a second screw of the same size. This discharges, through a peripheral screen, into either of two Fuller-Kinyon pumps, each of which is equipped with a Blaw-Knox Tracyfier to remove any moisture. Each of the



Elevators for clinker and gypsum, with their drives on platform above.

screw conveyors is driven by a Westinghouse 10-hp. motor through a De Laval worm-gear speed reducer.

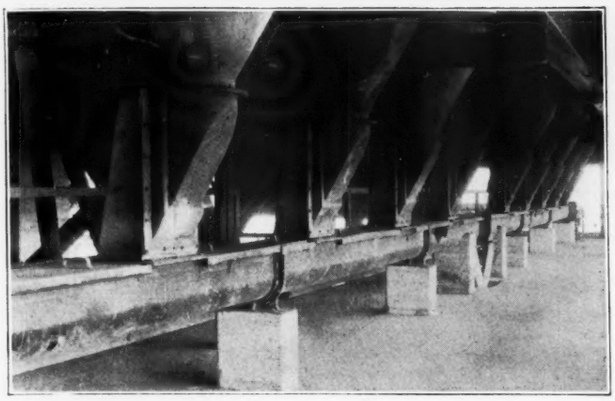
The Fuller-Kinyon pumps transport the cement from the mill building either to a stockhouse of 200,000-bbl. capacity or to silo storage. There are eight silos in a single row, each 40 ft. in diameter by 70 ft. high and with a 23,000-bbl. capacity. Each of the two storage units has a separate packhouse with four Bates 3-bag packers.

The dust-collecting system in the new mill building also is unusually interesting. Each of the two Compeb mills has an Allis-Chalmers 5-compartment Style C, 15-bag dust collector. These collect dust from the top of the clinker elevators, from the Poidometers, from the elevators feeding the separators, and from the discharge ends of the mills.

Each dust collector has an American Blower Co. No. 55 fan, driven through Texrope drive, by an Allis-Chalmers 30-hp. motor.

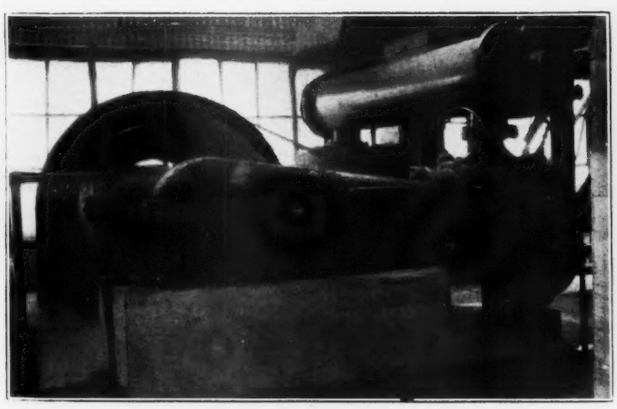
An Allis-Chalmers 3-hp. motor operates the shaking mechanism, on each of the dust collectors, through a Texrope drive. This mechanism consists of a shaft with five cams, one for each compartment of the dust collector. When a cam reaches a bottom position it closes a drum valve to the exhauster and contacts with a shaker ratchet which snaps the bags against a spring tension. The valve closes off the fan, when the bags are shaken to prevent dust being pulled through the bags and wasted. Each of the five cams is in a different position so that only one compartment is being shaken at a time.

The intake pipes leading from the various points to the dust collectors are not customary straight

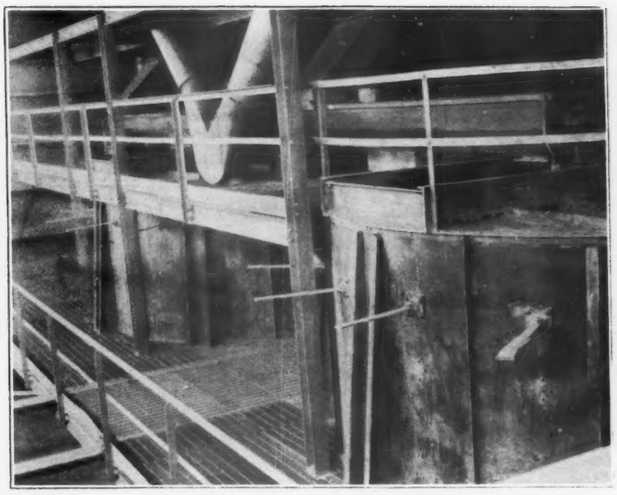


This screw conveyor handles the discharge from the dust collectors.

pipes. Instead they zigzag from one point to another. At each joint there is an enlarged elbow which slows the velocity of the air at these points, allowing the coarser particles of dust to drop back against the air stream into the grinding circuit. The coarse dust collected from the clinker elevator, Poidometers, and the elevator to the first air separator drops back into the elevator to the second separator from which it goes back into the mill. This same procedure is followed throughout. This system also eliminates any necessity for cleaning out the pipes.



Compressor which furnishes air for pumping cement.

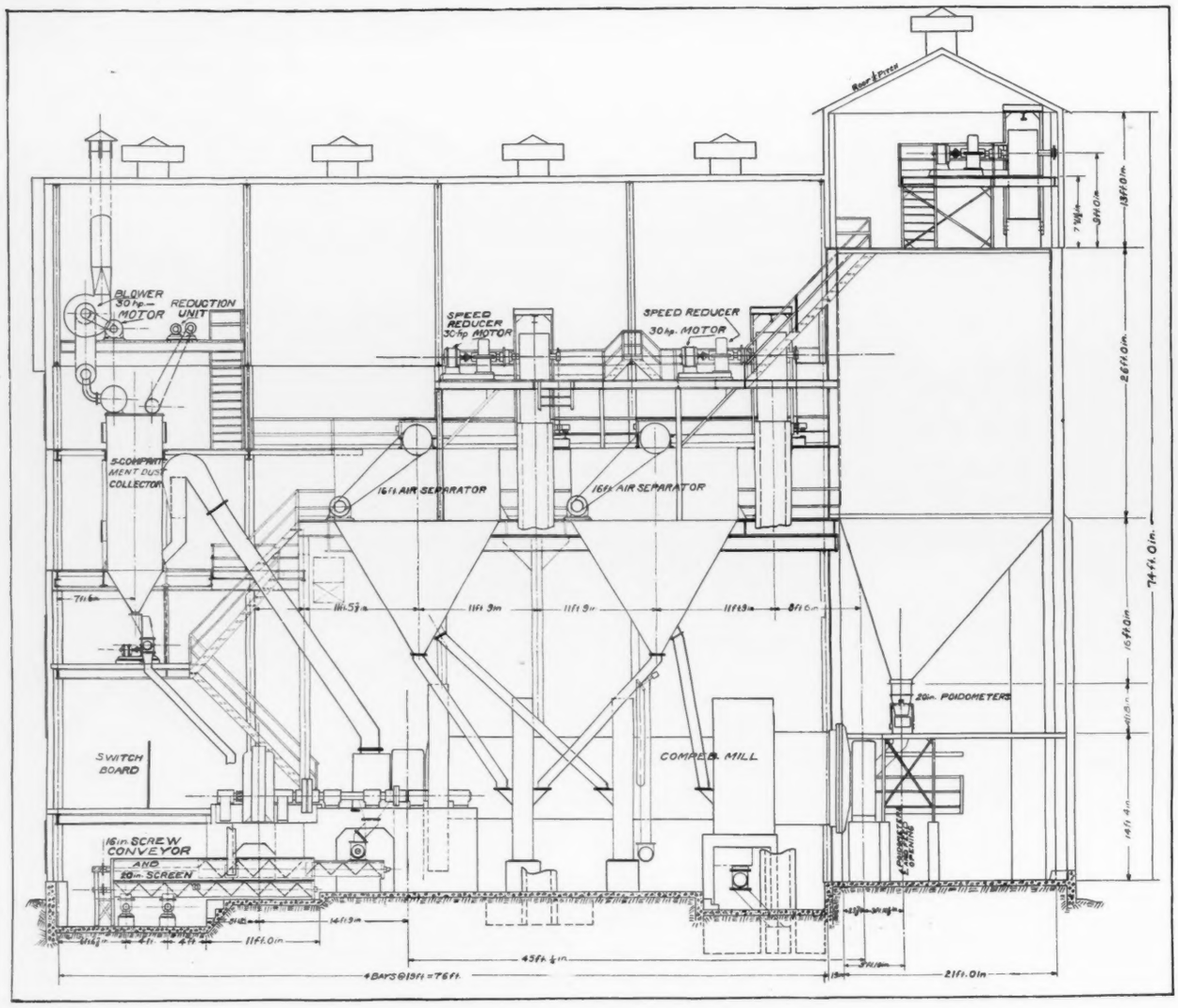


Two of the 16-ft. air separators, screw conveyor, and elevator feed.

Each of the two dust collectors discharges to a 9-in. screw conveyor which is driven, by a Westinghouse 2-hp. motor, through a De Laval worm-gear speed reducer. Both screws discharge through the same chutes into the mill stream at the screw conveyor feeding the Fuller-Kinyon pumps.

With this system, an average of 200 bbl. of cement per hour is being produced by each Compeb mill which is ordinarily rated at from 150 to 160 bbl. That this is being done without any sacrifice of quality in the cement is evident from the fact that 92.5 per cent will pass through a 200-mesh screen. There is also a considerable saving in power and labor required to operate the finish mills.

One of the fans on the dust-collecting units.

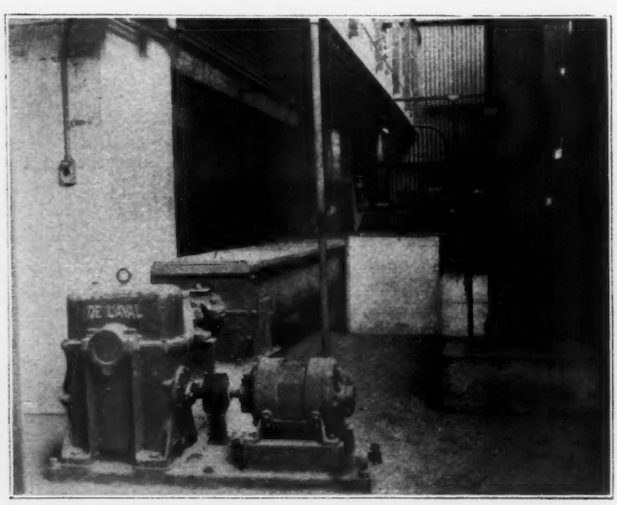


Sectional vertical elevation of new finish mill.

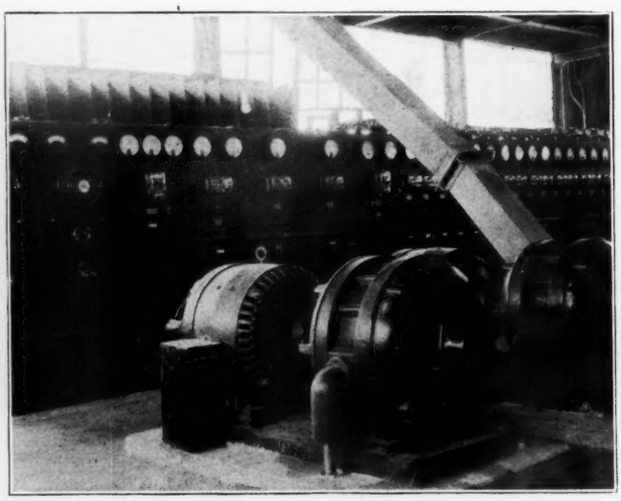
A Pennsylvania Class DE2 twin-cylinder air compressor furnishes air for the Fuller-Kinyon pumps and is connected with compressor lines from other parts of the plants. It is driven by a Westinghouse 150-hp. synchronous motor and has a Protectomotor air filter on its intake.

The mill building has a foundation of concrete

(*Continued on page 28*)



Speed reducer for screw conveyor from the finish mills to the cement pumps.



The main electric switchboard and the generating set for the finish-mill motors.

The worked-out portion of the pit makes a convenient disposal ground for the strippings.

Strips in Winter, Excavates Gravel in Summer with Same Machine

Dumps Spoil into Worked-Out Portion of Pit by Use of Power Drag Scraper

WHENEVER local conditions make it possible, one of the best methods of stripping a mineral deposit is to cast the spoil into a worked-out portion of the pit. When a separate machine is used for stripping and the face of the pit is long enough that stripping does not interfere with the working of the mineral deposit itself, the two operations are often carried on simultaneously; in other cases the same machine is used both for stripping and for excavating, and stripping is done in seasons when the working of the pit is suspended.

The Crawford Sand & Gravel Co. of Meadville, Pa., follows the later plan of operation, for the winter shut-down of the washing and screening plant allows ample time to strip enough of the deposit for the following year's operation, and the company's 2-cu. yd. Sauerman power drag scraper has plenty of capacity for both the stripping of overburden during the winter and the excavation of sand and gravel in the other seasons.

In the stripping operations of the past winter, the Crawford Sand & Gravel Co. cleared off a topsoil 11 ft. deep from an area of approximately 180 ft. by 175 ft., casting the spoil into the worked-out section adjacent to it. This old pit, incidentally, had furnished about 40,000 tons of marketable sand and gravel in addition to some quantities of sand that were not marketable within the trading area.

This stripping work was accomplished by installing the 2-cu. yd. power scraper in the manner shown in the accompanying illustrations. The Sauerman electric scraper hoist and the head mast were set up on the farther edge of the old pit and the operating cables reached out across the old workings to the site of the stripping work. The tail end of the span was fixed by a low tail tower at the rear of the area to be stripped, and the scraper worked forward from this tail tower to the point where the spoil was discharged over the edge of the area into the old pit. The scraper's line of operation was shifted at intervals by means of a Sauerman hand-winch rapid shifting device, which is recommended for any earth-moving work of this type in order to crowd the scraper against the side of the cut and leave a smooth surface behind.

Much of the stripping work during the past season was done in extremely cold weather, the temperature being many times below zero, and the scraper's capacity over the 400-ft. span was kept down to an average of about 40 cu. yd. per hour. In spite of this handicap, however, the total stripping expenses were only $2,766, or considerably less than stripping costs in years before the scraper was installed.

The scraper was installed early in 1927, replacing

* Reprinted from *Sauerman News* for September, 1930.

General view of both the old and new workings.

The 2-cu. yd. scraper in action.

a clamshell crane which, on the stripping operations, loaded the spoil into trucks to be hauled away. The stripping costs for the first season after the scraper was installed were only about one-fourth the costs that had prevailed before that time. In the sand-and-gravel excavating, the crane loaded material onto a belt conveyor leading to the plant, and the use of the scraper for this work increased the plant's capacity.

The sand-and-gravel plant is on the main line of the Erie Railroad midway between Meadville and Saegertown, Pa., and about 500 ft. away from the gravel bank. This 500 ft. is spanned by a belt conveyor, and the power scraper when excavating sand and gravel delivers the material to a field hopper which feeds this belt.

Officers of the Crawford Sand & Gravel Co. are Thomas J. Cole, president and general manager; A. E. Teifer, secretary; Dr. O. H. Jackson, treasurer; F. M. Brown, sales manager, and O. E. Lamb, general superintendent.

Employs Air Separation in Mill

(*Continued from page 26*)

on piling. The super structure is of structural steel with corrugated-asbestos siding and roofing. The steel stairways and floors, as well as the steel framework and the bins were furnished and erected by the Mississippi Valley Structural Steel Co. All of the bucket elevators were furnished by the General Conveyor Co., and the four screw conveyors under the Compeb mills by the Jeffrey Mfg. Co. All other screw conveyors are Link-Belt. All of the concrete was poured, the machinery erected, and the electrical work done by the company's forces.

A Lo-Hed 1-ton-capacity overhead monorail crane made by the American Engineering Co. is used to load the mills and handle manholes. Yale chain-hoists at various other points facilitate repairs and installations. Falk-Bibby flexible couplings are used on all Falk speed reducer drives, De Laval couplings on De Laval speed reducer drives, and Allis-Chalmers leather-bushed couplings on the mill drives. Crouse-Hinds electrical conduit is used.

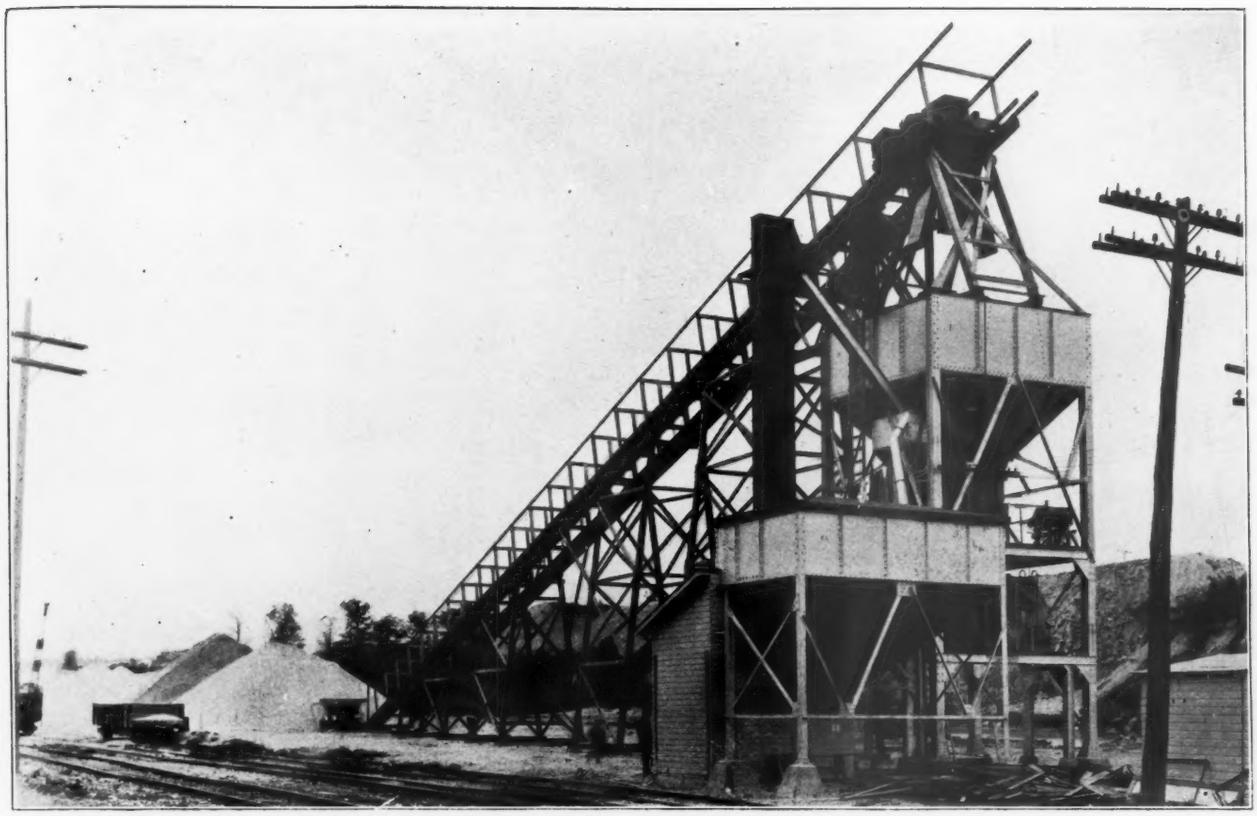
Power is received from the Velo plant at 2,300 volts. Some of this goes directly to the main Westinghouse switchboard for all motors of 150 hp. or over. An outdoor substation reduces the voltage to 440 for all motors of less than 150 hp. All motor starters are at the central switchboard with push-button controls at each motor. Cutler-Hammer controllers are used for the 1,000-hp. mill motors.

The quarry and crushing plant which furnish the raw material for the Red Ring and Velo plants were completely described in an article on page 45 in the Feb. 13, 1929, issue of PIT & QUARRY. No changes of any importance have been made since.

The stone from the crushing plant at the quarry is fed to either gyratory crushers or a Dixie hammer mill for reduction, while the shale goes to a smaller hammer mill. These two materials are then roughly proportioned in a mix bin. Preliminary pulverizing is done by three F. L. Smidth Size 106 Kominutors. These feed by elevators to twelve Hum-mer 4-ft. by 5-ft. single-deck vibrating screens—two pairs to each mill. The tailings return to the Kominutors. This screening installation was made in Feb., 1930.

The fine material from the screens feeds to three F. L. Smidth No. 20, 7-ft. by 23-ft. tube mills. These discharge by gravity to any of three correcting basins from which the slurry is pumped by air lifts into the storage basins. From these the slurry is pumped to the kiln feeders.

Each of the four Allis-Chalmers synchronous Ferris-wheel feeders feeds to one of the four 10-ft. by 11-ft. 3-in. by 240-ft. kilns. Each kiln is driven by a 75-hp. motor. A Texrope drive from the kiln-drive shaft operates a 5-kw. direct-current generator which operates the 3-hp. d.c. motor driving the feeder with constant voltage, separate excitation. In this way, the feeder speed is in constant ratio with the kiln speed. A rheostat controlling the feeder motor allows the ratio between these speeds to be altered as desired. Four 7-ft. by 63-ft. rotary coolers discharge the clinker to open storage, from which point operations have been described.



General view of plant. Note cement hoppers and overflow return spout.

Finds Small City Offers Big Opportunity in Ready-Mixed Concrete Field

Waukesha, Wis., With 22,000 Population Has Two Plants in Direct Competition

AN outstanding example of a successful ready-mixed concrete plant in a small city can be found at Waukesha, Wis., where Cayll & Barrett, Inc., is about to complete its first year of operation.

Waukesha is situated about 15 miles west of Milwaukee. It has considerable industrial activity and enjoys a large tourist business from nearby inland lakes. Numerous springs in and about the city have made it famous the country over for the excellent quality of their water. The name "Waukesha," referred to spring water, is a household by-word throughout the Middle West.

Some authorities believe that a town of but 22,000 population offers little opportunity for a profitable market for a ready-mixed concrete plant. Not only does one plant of this type exist in Waukesha but two—in direct competition with each other—neither of which touches the Milwaukee market 15 miles away!

An excellent site for a ready-mixed plant existed on the property of the Waukesha Lime & Stone Co., a large sand-and-gravel as well as crushed-stone producer. This area of six acres of land, directly south of the extensive stock-piles of sand and gravel of the company, with side-track facilities and nearby paved streets for truck transportation, offered a fine opportunity for a concrete plant, and several well-known companies soon became interested. E. P. Barrett and A. Cayll, who were formerly in the contracting business, obtained a long-term lease on the location, and have entered into a working agreement with the Waukesha Lime & Stone Co. for the purchase of sand and gravel aggregates.

Three stock-piles of aggregates are carried on hand at all times. Carloads of aggregates are moved down the tracks from the Waukesha Lime & Stone Co. (a distance of only two city blocks) and are unloaded by means of a Koehring crane equipped with a ¾-cu. yd. clamshell bucket which is the property of the lime and stone company. All aggregates are purchased delivered on the Cayll & Barrett stock-piles.

Faced with the possibility of competition in the already limited Waukesha market, the plant was designed as a model of materials-handling efficiency,

The ¾-cu. yd. clamshell crane handling aggregates at stock-piles.

E. P. Barrett, president.

using the latest and most modern equipment obtainable. It has since achieved the reputation of being one of the best designed plants in the Middle West, and its successful and profitable operation is a tribute to the undaunted courage of Messrs. Cayll and Barrett.

Construction of the new plant began with the placing of forms for footings and the stock-pile tunnel in December of 1929. The tunnel-conveyor method of handling stocked materials simplifies the problem greatly, and its use typifies the modernity of the design of this plant. The tunnel is built of reinforced concrete, 6 ft. wide, 7 ft. high, and 112 ft. long, with the floor placed 3 ft. below the ground level. This part of the plant was built in co-operation with the lime and stone company. At the expiration of the lease it becomes the property of the latter company, should the lease fail to be renewed.

Stock-piles and loaded cars from top of the plant.

Eight Butler Bin. Co. radial-type gates in the ceiling of the tunnel have access to the three stock-piles of aggregates; two gates for the No. 4 (2½-in. to 1¼-in.) gravel, two for the No. 3 (1¼-in. to ¼-in.) gravel, and four gates below the torpedo-sand stock-piles.

Stearns equipment, featuring Timken bearings in the idlers, which require oiling but once in sixty

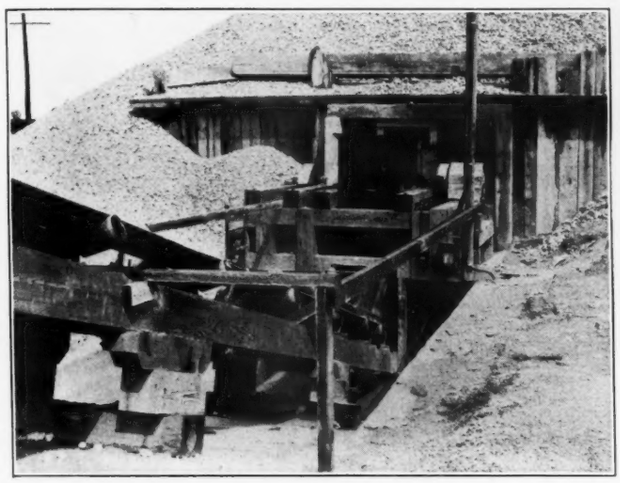
Inside the stock-pile conveyor tunnel. Note radial gates.

days, are used in the two plant conveyors. The tunnel conveyor is 109 ft. long and has a 24-in. Clifton rubber belt made by the New York Belting & Packing Co. It is driven by an Allis-Chalmers 7½-hp. motor located at the mouth of the tunnel. Material discharges from this conveyor into a Stearns feeder hopper which places it directly on the plant elevator which extends from the sump at the mouth of the tunnel to the platform above the aggregate hopper of the plant. Stearns equipment, with a 20-in. Clifton belt, is used also in this conveyor, which is 220 ft. in length. An Allis-Chalmers 15-hp. motor with a 10-groove Texrope drive serves as the power unit. The trestle for the conveyor is of wood

construction, set on concrete piers. It has a pitch of 18 deg.

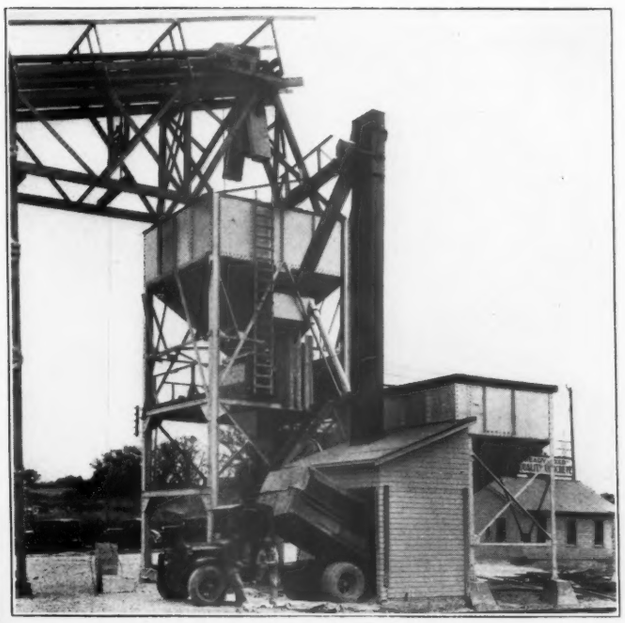
After the aggregates reach the top of the storage hopper they are chuted to their respective compartments by means of a flip-flop gate in the discharge spout. A total of 110 cu. yd. of material can be retained in the steel aggregate hopper.

Cement is delivered to the plant in truck loads, and provision has been made for carload shipments, as the receiving hopper is located directly along a side-track. The trucks back their 6½-ton loads of cement into the hopper-building doorway, which permits access to the receiving hopper located at the ground level. Difficulty was encountered at first with water seepage through the concrete walls of the receiver sump but, after treatment with a water-proofing compound, the trouble was remedied.



Mouth of tunnel showing conveyor and feeder.

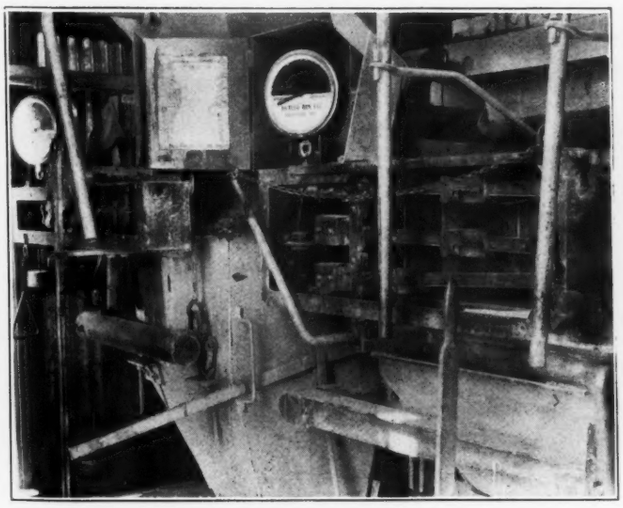
A short screw conveyor in the hopper feeds the cement into the boot of the Chain-Belt Co. bucket elevator transporting it to the plant auxiliary hopper above the cement weighing equipment. When this auxiliary hopper is filled, an overflow pipe conducts the cement down to a large storage hopper, thus building up a reserve supply of 100 tons.



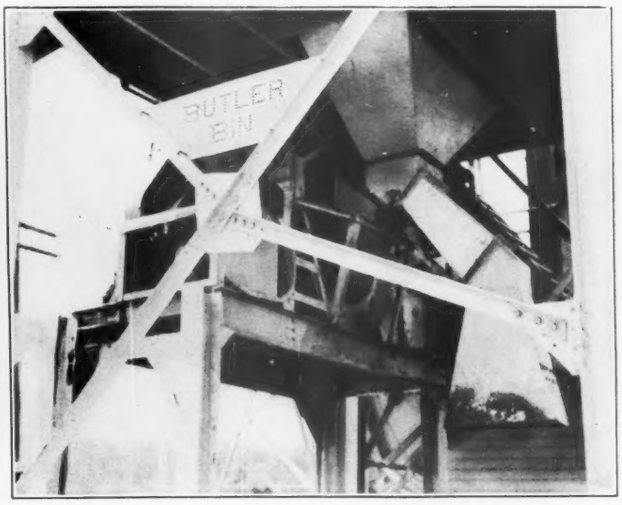
Bulk-cement truck unloading to receiving hopper. Wall in foreground may be removed for receiving carload shipments.

Cement from the bulk storage hopper can be returned to the bucket-elevator boot by means of a spout loading to the receiving hopper. This system forms a complete circuit, practically automatic, always insuring a steady supply of cement for the weighing hopper. The Chain-Belt elevator is 46 ft. high and has 8-in. by 6-in. by 5-in. buckets. It is driven by a 5-hp. motor.

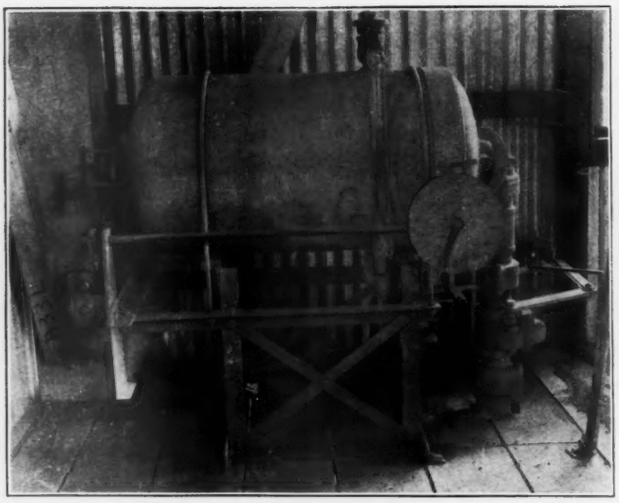
The aggregate and cement weighing mechanism is located on an enclosed platform directly below the aggregate storage hopper. Again Butler equipment was selected for this important phase of making ready-mixed concrete. A double-compartment aggregate weighing hopper is used, receiving its material from the radial gates above, and discharging into the bifurcated mixer spout beneath. It is equipped with a three-beam scale fitted with a telltale dial. For each proportion of mix, the scale poises are set and, as the material is fed to the



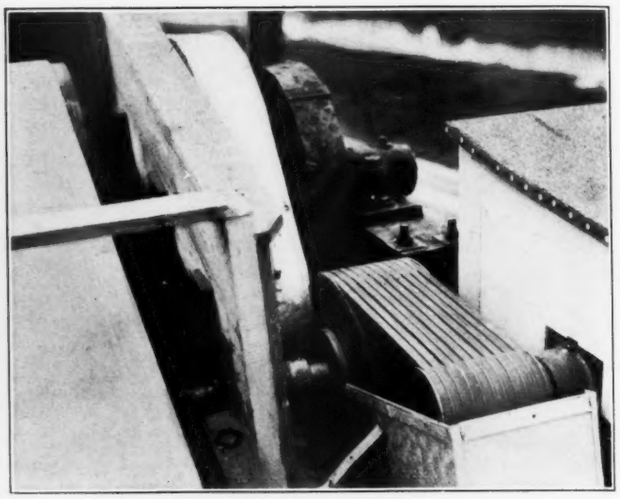
Weighing hoppers for the cement and aggregates.



Mixer and pant-leg chute for dry-batch truck shipments.



View of the water-control tank.



V-belt drive and enclosed motor at head pulley of main conveyor.

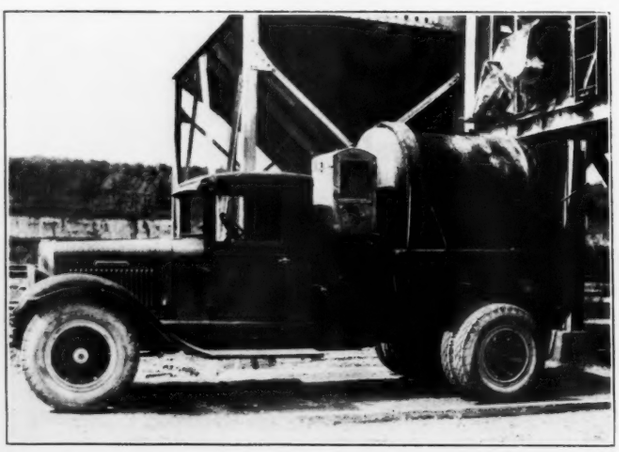
hopper, the tell-tale warns the operator of the approach of the desired weight, giving him plenty of time to close the radial feed gate. This arrangement permits accurate and rapid weighing with the danger of over-filling eliminated. Each beam of the scale has a capacity setting of 3,000 lb.

Adjacent to the aggregate weighing equipment is the cement weighing hopper. Cement is received from the 15-bbl. auxiliary hopper overhead and its flow is controlled by a Fuller-Kinyon rotary filling valve. A single-beam scale also equipped with a tell-tale dial operates in the same manner as does the aggregate scale. Discharge of the cement is made directly to the mixer spout.

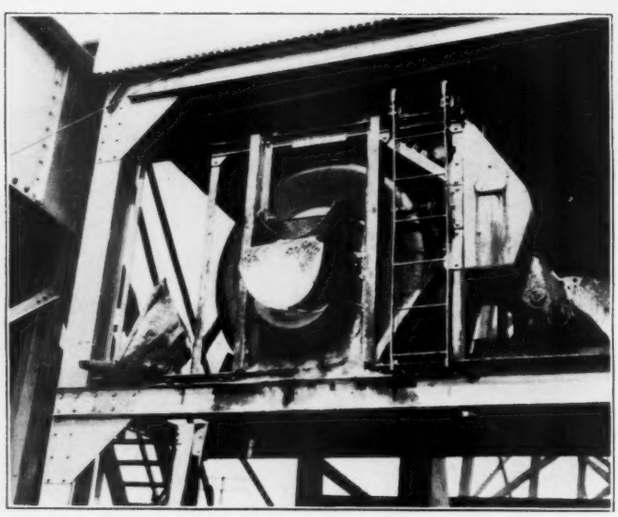
A Rex water-control tank similar to those used on Rex pavers, is mounted on the floor of the working platform. It has a capacity of 50 gal., and is equipped with a calibrated dial for volumetric control.

Weighed material from the hoppers is spouted either to the mixer or to a spout for dry-batch truck shipment. A bifurcated spout fitted with a flip-flop valve permits ready control for either method of handling. A great deal of paving is done in this locality with the mixer on the job but supplied with truck loads of weighed cement and aggregates from the Cayll & Barrett plant. State specifications strictly require weighed cement and aggregates and, for this reason, the plant was built to permit the sale of weighed dry batches. This same spout can be used to charge mixed-in-transit truck mixers.

At present a 1-cu. yd. Rex mixer is used. It is of the rotary-drum type, chain-driven from a 25-hp. motor. Shipment of the mixed concrete is made in either bath-tub or Clinton tank bodies. Two Clinton tank bodies, each powered by its own Le Roi engine, serve Clintonized concrete to the trade. Their capacity is 2 cu. yd. each, and they are mounted on International 5-ton trucks. The two



Delivery truck with rotating body for conditioning the concrete.



Close-up of the electric motor-driven mixer.

bath-tub bodies have a capacity of 1½ cu. yd. each. One is mounted on a Ruggles 3-ton truck and the other on a Graham Brothers truck of similar size.

The water supply is obtained from a well drilled adjacent to the company plant office. A Trupar pump, sold by the Standard Sanitary Mfg. Co., with a pressure tank automatically takes care of the plant water requirement.

A Uarco system of bookkeeping is kept for the

(*Continued on page 37*)

Hazards Involved in the Transportation of Explosives in Motor Trucks *

By C. W. OWINGS and J. M. HARRINGTON
U. S. Bureau of Mines

THE transportation of explosives, and especially their distribution from the supply magazines of the manufacturers or dealers to the mines, quarries or other points where they are to be used, by means of horse-drawn vehicles is an old-time practice, and the records of accidents of the past show this to have been a hazardous undertaking requiring for safety the taking of many precautions not required in the transportation of other merchandise.

Displacement of the horse-drawn vehicle by the motor vehicle for the transportation of explosives is increasing rapidly. A consideration of the facts that the vehicle is operated by an explosion engine, using easily vaporized liquid fuel; that the charges in the engine are fired and the vehicle lighted by electricity; and that the vehicle, being insulated from the ground, may accumulate static charges led to the conclusion that new hazards are being introduced into the transportation of explosives through the use of motor-operated vehicles, and that therefore additional special precautions must be taken against these additional hazards.

That accidents have already occurred in this use of motor-vehicle transportation is evidenced from the following examples:

Recently in California, a driver loaded a box of granular powder in the rear of an automobile truck and a box of electric detonators in the front. Suddenly, while traveling along a highway, the explosives detonated, demolishing the truck, and blew the body of the driver into small pieces. No evidence was left to show the cause of the explosion, but it is assumed that a jar or other means caused the detonators to fire, and that they in turn detonated the explosive. It should be recognized that it is unsafe to transport detonators and explosives in the same compartment, and this rule should be strictly enforced. At present this rule appears to be either unknown or, at least, frequently ignored.

There are usually so many possible causes of ignition or detonation of a truck load of explosives that it is often impossible to state definitely the exact cause in a given case. This is well illustrated in the following account of an accident. A trucking company was hired to haul a truck load of explosives about 200 miles. The driver had had experience in driving trucks of explosives, and it was stated that he inspected the truck carefully before leaving the garage. Eighty 50-lb. boxes of explosive were placed in tiers on each side of the truck and 265 25-lb. kegs of black blasting powder were placed in the center of the truck. The boxes were placed flat and the kegs were placed on end, arranged in tiers. While the truck was being driven along the highway there was a muffled explosion. When some men, who were about a quarter of a mile away, arrived at the scene the truck was in flames and they could get no nearer than 100 feet. The driver was sitting in his seat and had apparently been killed instantly either by shock or fumes. When the flames were finally quenched, the driver's body was recovered, badly charred. It was found that several boxes of explosives had been thrown about 40 feet by the initial explosion but were uninjured. A total of half a ton of dynamite was recovered. The cover to the gasoline tank could not be found.

Numerous unsafe conditions were discovered. Metal was exposed on the inside of the truck, thereby providing a means of conducting an electric current if the ignition system became short-circuited. No protective device or spring cap was used on the gasoline tank, and therefore there was danger of gasoline fumes or gasoline escaping from the tank falling on the hot exhaust pipe and igniting. There was no protective wire gauze or flame baffle on the exhaust pipe to prevent a back-fire flame from igniting the explosives, oil, or gasoline. The bottom of the truck was not protected by asbestos or other heat-absorbing material, and the wiring of the electrical system was by no means rugged. Moreover, several different kinds of explosives were loaded on the same truck, and the kegs of black blasting powder, instead of being placed on their sides and staggered, were placed in tiers and set on end, thereby making it possible for the bungs to be opened by the movement of the chime of an adjacent keg.

The fire burned most of the inflammable parts of the truck, and hence much of the evidence was destroyed so that the exact cause of the detonation and fire could not be determined definitely. There were several possible sources of ignition. If the driver were smoking, gasoline from the tank, located under the driver's seat, or explosive in the truck may have been ignited. Although the man was in the habit of smoking occasionally, his employer believed him too careful to have smoked in the truck while transporting explosives; only too frequently persons who transport or handle explosives persist in smoking while so doing.

The end of the exhaust pipe was about under the center of the cab, was not within less than 4 in. of the wooden flooring of the truck, and was not within 4 ft. of the load. As the truck was traveling upgrade at the time of the explosion, the chances of back-firing were remote; however, there

* Reprinted from U. S. Bureau of Mines Information Circular 6330.

is a possibility that sparks from the engine were carried to the load by wind.

The gasoline tank, gasoline line, carburetor, and vacuum-feed tank were said to have been inspected and found in good condition on the day the truck started on the trip; however, the cap to the gasoline tank could not be located after the fire. As this was the only opening found in the tank, it is possible that the cap had not been properly replaced upon filling the tank during the trip and that the gasoline or gasoline fumes may have come in contact with the hot exhaust pipe and ignited or exploded.

The accident occurred during daylight, and the lighting switch was in the "off" position; nevertheless it would be possible for a short circuit to take place in one of the lead wires from the generator or the battery to some metal part. An electric spark may then have been carried through the sheet steel in front of the body to the black blasting powder.

No moisture had fallen in the region for several weeks, and the air temperature was between 90 deg. and 100 deg. at the time of the accident. Under these conditions it would be possible for a spark of static electricity to have been formed. Such a spark would be capable of igniting the explosives.

The black blasting powder was in kegs constructed of No. 28-gauge sheet steel, mechanically crimped together at the joints. The opening in the top of each keg was sealed by means of a cardboard gasket and a metal plug, held in place by a metal slide-gate. Each keg had been immersed in heavy asphaltum paint, tending to prevent leakage from the can and to protect against sparks induced by friction. There is no question that some fine particles of black blasting powder escaped from one or more of the cans and then were ignited by at least one of the above enumerated causes.

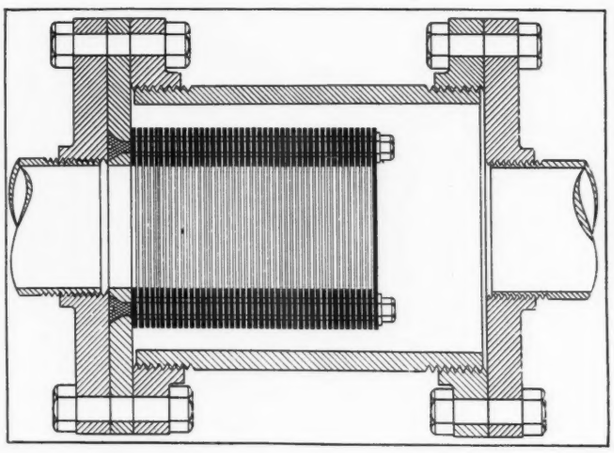
The manufacturers of explosives have recognized the necessity of transporting explosives by automobile trucks and they have given close attention to the safety of their drivers by providing definite rules for safeguarding the truck. The Hercules Powder Co. issues the following standard truck specifications for hauling explosives:

> Motor vehicles used for hauling explosives at various magazine distributing points must comply with the following specifications:
>
> (1) Covering consisting of ¼-in. asbestos and No. 20-gauge sheet-iron should be placed on the underside of the box, under the gasoline tank, under the foot-boards and up the front end of the box between the box and the cab. If the dash-board is not metal, it should also be applied to the dash-board.
>
> (2) A metal shield should be placed under the gasoline tank and over the exhaust pipes so that any leaking gasoline will shed off and not drop on the hot exhaust pipes.
>
> (3) The cab should be equipped with two fire extinguishers. It would also be well to have convenient containers filled with dry sand in a convenient place, for this is one of the best agents for putting out fires around motor vehicles.
>
> (4) All nails and bolts on the inside of the box should be blind or countersunk and plugged, so that no sparking metal is exposed. Nothing but some non-sparking metal such as brass should be exposed on the inside of the box or used to bind the top of the box or tail-gate.
>
> (5) The shut-off valve in the gasoline line near the gasoline tank should be equipped with an extension with knob on the end, at a convenient point near the driver's seat so that the driver can shut off the gasoline at the gasoline tank without taking up the floor boards.
>
> (6) The pan under the engine should have a slit in the bottom about ¾ in. wide and extending practically the full length of the pan. Metal is left in place at two or three points, merely to hold the two halves together. This slit should allow all gasoline and oil that may drop into the pan to drain out and not accumulate in the pan for such an inflammable accumulation is a bad fire hazard. In addition, special precautions should be taken in operating the truck to see that the engine, pan and other parts of the truck are kept free from accumulations of gasoline, oil, grease and other inflammable material.
>
> (7) Only electric lights should be used and should consist of two headlights, two side lights and a tail light. If convenient, the tail light should be put in series with a dash light as an indicator. A good high-tension generator and an approved type of storage battery should be used. The generator should not be relied upon alone for lights for, in case of engine trouble, lights would not be available. No part of the electric system should be grounded to the truck frame or body, but instead all wires should be double run in armor-steel conduits only, the two-wire system being used. The lighting system should not include a portable light or spotlight.
>
> (8) A heavy tarpaulin should be used, and a loaded truck should at all times be covered with it.
>
> (9) Truck should be equipped with such accessories as mirror, horn, bumpers and speedometer.
>
> (10) On each side of the body and on the tail-gate, in letters 6 in. high should appear: EXPLOSIVES—DANGEROUS! The color usually recommended for the body is a vermilion red with letters in a contrasting color such as aluminum color.
>
> (11) All gasoline-tank inlets and outlets should be equipped with Protectoseals.
>
> (12) The exhaust pipe should be equipped with a flame baffle fitted to the end of the pipe. This flame baffle can be made of 40-mesh wire screen cloth having a net sectional area equal to the diameter of the exhaust pipe.

The gasoline inlets and outlets are protected by a device consisting of a combination screen that fits into the tank, thereby preventing communication of flame outside of the tank if a spark ignites the fluid in the tank, and a cap, generally spring-hinged,

that prevents evaporation of the gasoline and provides an automatic pressure relief and a vacuum breaker, by allowing air to intake into the tank. A protection of this nature should be provided on all trucks hauling explosives.

The exhaust pipe should be protected by a flame baffle. A disk flame baffle made by the Protectoseal Co. is shown in the accompanying illustration. In case of a backfire the flame would enter the series



Cross section of disk flame baffle.

of disks. The outermost disk is solid, and the flame and hot gases must therefore pass through the openings between the disks. The openings are made according to a definite ratio with the disks. The hot gases in passing through the openings are cooled below ignition point, and hence the flame does not pass out of the baffle.

To prevent sparks of static electricity from forming, it is advisable to connect a chain to the truck and allow it to drag on the ground as is required for trucks transporting gasoline.

The explosives division of the U. S. Bureau of Mines has prepared for the information of its staff the following instructions:

Explosives may be hauled by motor vehicles.

When used in hauling explosives the vehicle must be placarded "High Explosives—Dangerous" and it must conform with any other regulations, laws, or ordinances of the Interstate Commerce Commission and of the states, municipalities, and communities through which it is to pass.

Before explosives are loaded into a vehicle, the body of the vehicle should be thoroughly swept.

Vehicles must always be kept in first-class repair.

Boxes of explosives must be so arranged and stayed in the body of the vehicles that they cannot shift during transportation.

The containers of explosives must be protected from exposure to the sun's rays, rain or snow. They should rest upon and be covered by a canvas or tarpaulin. Preferably they should be placed and locked in a large covered box or compartment; the inside surface should be wholly of wood. The box or compartment must be located as far as possible from the engine and effectively insulated from it and from all sources of electricity. The engine exhaust must be pointed downward.

No detonators or electric detonators should be hauled with explosives, except when going to make a demonstration; to fire a blast; or in the collection of field samples, and then the detonators or electric detonators must be placed in such a receptacle and at so remote a distance from the explosives in the vehicle that the explosion of the detonators, or electric detonators, could not induce the explosion of the explosives through the intervening barricades. In order to prevent any accumulation of static electrical charges on the truck, a metallic chain sufficiently long so that at least four inches of its end will drag upon the ground should be attached to the rear end of the truck, or motor vehicle.

No metallic objects, such as tools and machinery, or heavy masses should be hauled in the same vehicle with explosives, or with detonators, or electric detonators.

No vehicle containing explosives shall be left alone until the motor has been stopped and the brakes set. Safe practice requires that there should always be a guard on a vehicle containing explosives.

During haulage of explosives, avoid as much as possible congested thoroughfares, places where crowds are assembled, street-car tracks, and dangerous crossings.

Rules for transporting explosives, as recommended by the Institute of Makers of Explosives, follow:

In transporting explosives avoid all unnecessary stops. Do not haul through cities, towns or villages when possible to avoid it, but where this is necessary keep off congested thoroughfares, street-car tracks and dangerous crossings. Vehicles transporting explosives must come to a full stop before crossing any railroad track, and must not cross it until it is known the way is clear and no train or engine is approaching.

Do not leave any vehicle containing explosives unless team is securely tied and brakes set, or if motor truck is used, motor should be stopped and brakes set.

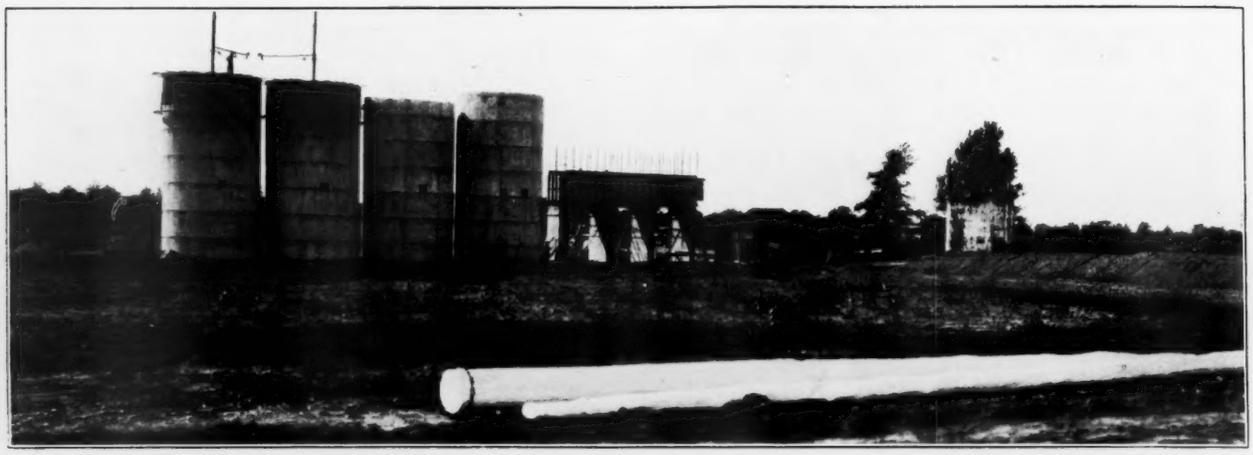
Do not carry blasting caps or electric blasting caps in the bed or body of vehicle containing other explosives.

Do not carry metal, metal tools or inflammable substances in the bed or body of vehicles transporting explosives.

The vehicle used for transporting explosives should have a close, tight floor. If there is any exposed metal on the inside of the body, it should be covered or protected so that the explosives containers will not come in contact with the exposed metal. Trucks used for the transportation of explosives should be clean, and free from surplus oil and grease, wiring completely insulated, gasoline and exhaust lines free from leaks, and the necessary precautions taken to prevent truck fires.

When explosives are on vehicles without tops they should always be protected from sun and weather by a tarpaulin.

(Continued on page 42)



Earthen bank at right will enclose stock-pile area. Timbers for power scraper in foreground.

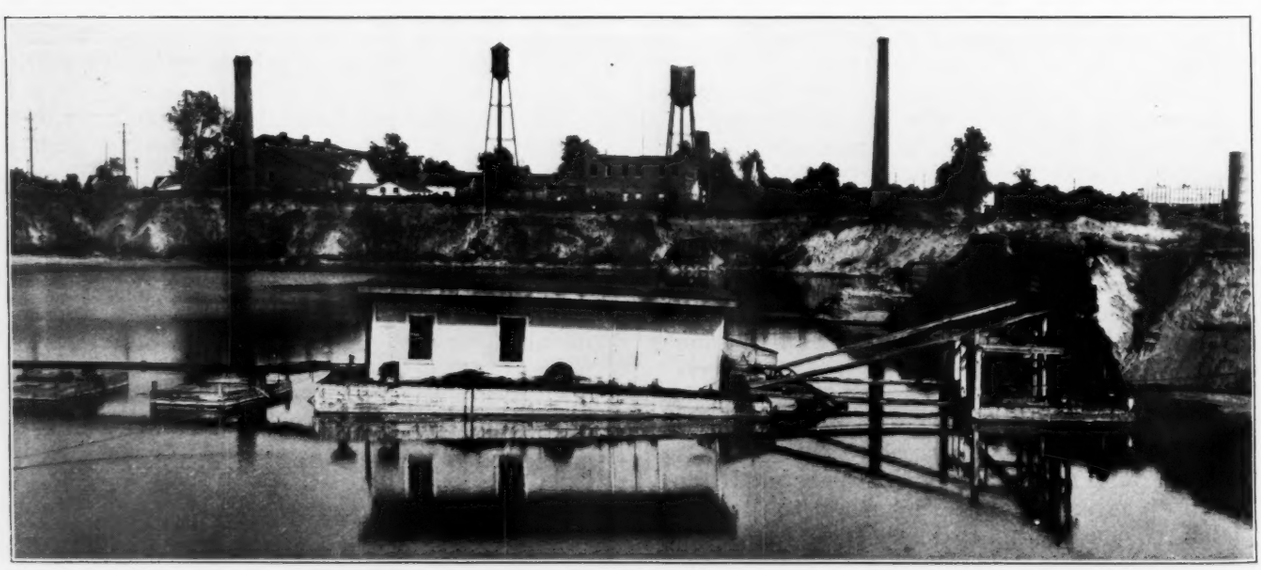
New Plant with Large Stock-Pile Yard Solves High Upkeep Problem

Pipe Line from Dredge to Plant Became Too Long to Permit Efficient Operation

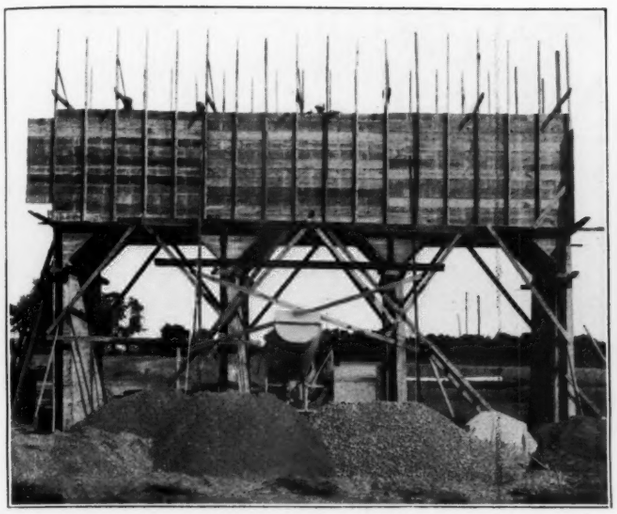
MARKED progress is being made at Noblesville, Ind., on a new gravel plant, which is rapidly nearing completion. Beginning, in 1907, with merely a few long-handled shovels in a small pit, the Baker Gravel Co. has grown steadily into one of Indiana's important sand-and-gravel producers. In 1916, the company reclaimed its raw material by means of a slackline cableway. In 1921, its first dredge went into operation.

The new equipment replaces the former tipple which was of timber construction. Maintenance costs became increasingly high until rebuilding became necessary. Coupled with this was the fact that the dredge had advanced far into the bank of gravel with an ever-increasing length of discharge pipe-line, causing greater friction losses and increased power requirement. Decision was made, therefore, to build a new washing and loading plant nearer to the dredge position. The new location is a fortunate one. It not only provides adequate space for stock-pile storage, but permits car-loading with great facility because of a slight decline of the side-track in front of the loading bins.

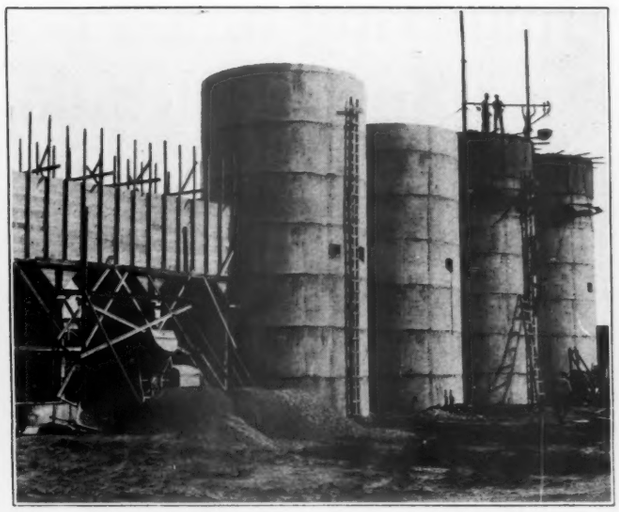
Crews of men are busily engaged in placing concrete for the new concrete silo-type bins. They are 20 ft. in diameter and will be 40 ft. high, with the exception of two, which are to be 35 ft. in height. This type of bin was selected because of its per-



Dredge operations along the south bank. New plant at right.



Form work set and concrete being placed for truck-loading hopper.



The concrete silo-type storage bins under construction.

manence and freedom from water leaks and maintenance. A number of concrete truck-loading bins also are being built adjacent to the silos. The washing and classifying equipment will be housed over the top of the silo car-loading bins.

In addition to much of the equipment used at the old plant, a Universal vibrating scalping screen will be installed as well as a Link-Belt rotary washing screen. Equipment for handling materials will be largely of Link-Belt manufacture.

To the east of the new plant, a large area of land has been set aside for a stock-pile system. The new method of stocking materials will permit the plant to operate continuously despite fluctuating demand and it will provide an extensive reserve in case of plant shutdowns for repair or replacements. With the aid of the stock-piles, shipment of gravel can exceed production for long periods of time.

The dredged material is pumped to a sump at the plant. Here it is re-handled by a dewatering bucket elevator which raises it to the washing equipment whereby it is classified into respective sizes, flowing either to the car-loading bins beneath or to a pile on the east side of the plant. A Sauerman 1½-cu. yd. Crescent power drag scraper will drag this gravel into extensive stock-piles. When the material is to be reclaimed, the power scraper is reversed, dragging the material into a hopper which feeds a belt elevator and returning it to the car-loading silos or the truck-loading bins. The power scraper will be operated by means of a National hoist driven by an 80-hp. General Electric motor.

Shovel removing overburden to horse-drawn wagon.

While the new plant is under construction, the company crew is engaged in removing overburden from the pit. An Insley ½-cu. yd. gasoline excavator is used, dumping into horse-drawn dump wagons which transport the material to waste piles.

The expected cost of the new improvements will reach $50,000, and the entire plant will go into operation in the spring of 1931. The old plant will be operated until the close of the present season after which it will be abandoned. E. A. Baker and E. S. Baker are the owners, and Forrest Beaver is superintendent. The W. H. K. Bennett Co. of Chicago, Ill., designed the new plant.

Small City Offers Big Opportunity

(*Continued from page 32*)

purpose of accurate check on the raw materials used and the product sold. Each month a report is made, to the Waukesha Lime & Stone Co., of the aggregates used and payment is made on this basis. Once a year an accountant is called in to audit the books, and any corrections are then adjusted.

Credit for the design of the plant is due to Mr. Barrett, who had the assistance and co-operation of the engineering department of the Butler Bin Co., as well as of the Chain Belt Co. The plant was designed for a capacity of 300 cu. yd. of mixed concrete per day but, with the dry-batch-truck shipments, as much as 600 cu. yd. of weighed material has left the plant in a single working day during the busy summer season. The bulk of the product has been sold to local industrial firms, contractors, and city pavement jobs. It is interesting to note that practically all of the paving in Waukesha during the past season was done with Cayll & Barrett concrete. All sales are made on a strength-guarantee basis. Accurate checks on the moisture content of the aggregates are made continually.

Officers of the company include E. P. Barrett, president and manager; A. Cayll, secretary-treasurer; and Scott Dowry, vice-president.

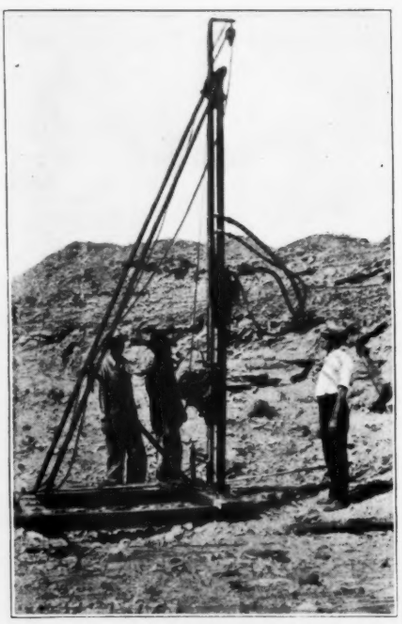
Quarrying and Processing Rock Asphalt in the Uvalde Area of Texas*

By C. H. VIVIAN

MOST of us know that the black asphaltic top coat so widely used on pavements in cities is prepared by mixing crushed rock and asphalt in the proper proportions. We are all enough acquainted with asphalt to know that it is a member of that large family, the hydrocarbons. Our general reading has informed us of the amazing lake of asphalt on the Island of Trinidad, and we are also aware that asphalt is the base of much of the world's petroleum, from which it is secured commercially by refining processes.

However, at several points on the globe there are areas where Nature has set up her own mixing plants and brought together rock and asphalt in such proportions that it is only necessary to mine and to crush the material before laying it down and compressing it into serviceable, durable road and street surfaces.

Such natural rock-asphalt deposits have been worked in Europe for several centuries. In the United States, commercial deposits of this kind occur in Texas and Kentucky. Those in Texas are the more important, and are being utilized to a greater extent. Pavements and roads built of this material compare very favorably with those of artificially prepared mixtures. Indeed, the two are essentially the same product. The use of natural rock asphalt has been confined to sections relatively close to the deposits because the material is expensive to ship great distances. Since the larger portion of it is rock, there is an economic limit beyond which it is cheaper to ship in only the asphalt and mix it at the point of use with stone secured from a local source.



One of the skid-mounted drifter drills.

Although asphalt has been employed extensively as a road-building material in recent years, its application in that field dates back less than a full century. Asphalt itself, however, is not a newly discovered material. It was well known to the ancients, and has been used down through the ages for a variety of purposes. Babylonian builders utilized asphalt to waterproof the foundations of their houses, to line the moat that surrounded their city, as a mortar, and in other ways. It was the principal constituent of the embalming fluid that so well preserved human bodies in mummified form. Much of the asphalt supply of those early users came from the Dead Sea. Large masses of it, apparently having exuded from crevices in the bottom, rose to the surface of the water, from where it was gathered with the aid of boats.

The Romans used an asphaltic coating to protect their household goods from decay. With them and other peoples it found great favor as a medicine. It was considered an excellent preventive for boils, gout, blindness, toothache, colic, and other ailments and afflictions. The women colored their eyebrows with it and used a perfume that was made from it. Asphalt is mentioned in several places in the Bible, and it is interesting to note that Noah gave the ark two exterior coats and one interior coat of bitumen to make it watertight.

Europe has a number of natural rock-asphalt deposits, the best known of which are at Seyssel, France, and Val de Travers, Switzerland. These were an important source of asphalt before the present commercial methods of obtaining the substance were known. It was extracted from the rock

* Reprinted from *Compressed Air Magazine*, September, 1930.

General view of the crushing plant, at left, and power house, right, of White's Uvalde mines. The rock-asphalt quarry, itself, is several hundred yards away.

Section of the open pit of the rock-asphalt mines showing quarrying operations.

by heating, or by the use of spirits; and the product obtained was called mastic.

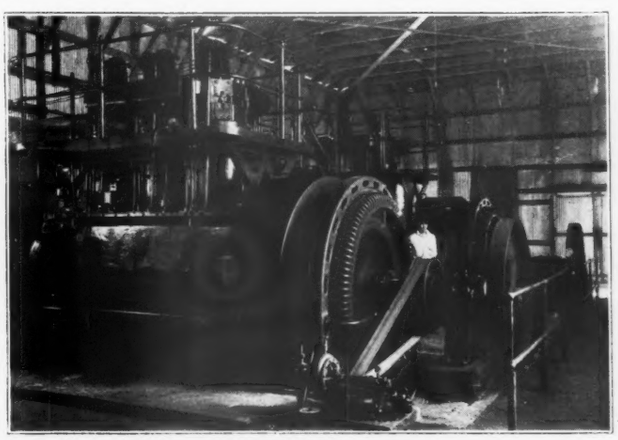
It was at Val de Travers that an engineer made the discovery, a little more than 100 years ago, that rock asphalt was an excellent road-surfacing material. That engineer was impressed by the fact that the road leading from the rock-asphalt quarry to the mastic factory never became muddy in wet weather nor dusty in dry weather. In seeking an explanation therefor, he observed that the springless carts used for hauling jostled some of the rock out upon the roadway, where it was crushed and compacted by their metal-tired wheels. That engineer had been attempting to construct roads of asphalt rock, but had been unsuccessful because he had omitted one very important requisite—the application of pressure. Once his observation of the road from the quarry had taught him this secret, he rolled the stone after spreading it upon the ground and succeeded in building a very satisfactory highway.

Rock asphalt was introduced in Paris in 1838 as a material for building sidewalks, but its use for this purpose did not become general until some twenty years later. The next step was, naturally, the adoption of rock asphalt for street paving. It was employed in this manner in London in 1869, and in Berlin in 1873. The first asphaltic pavement laid in the United States was put down in 1870, in Newark, N. J., by E. J. de Smedt.

From the foregoing facts it can be seen that natural rock asphalt was the forerunner of the prepared asphaltic street-surfacing material with which we are more familiar in the United States today. Europe has used the natural rock to a great extent because the material was readily available, and some of it has, in times past, been shipped to the United States. In this country, however, the trend was, from the outset, toward the prepared material. This was true because we then knew of no local natural deposits and, later, when some were discovered, it was too expensive to ship the stone from Texas or Kentucky over the country as a whole.

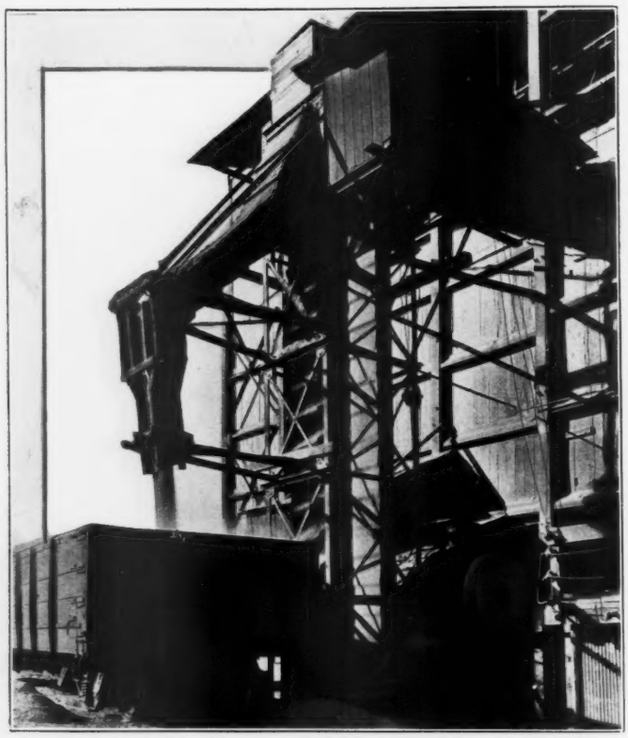
In the light of the present widespread use of asphalt paving, it is interesting to recall that there was much opposition to it when it was introduced. When the first asphalt-surfaced roads were proposed in England, the people objected on the score that black streaks across the landscape would mar the natural beauty of the countryside. Engineers pointed out to them that, after the free bitumen had worn off the surface, the prevailing color would not be black but gray—the lightness or darkness of which would be governed by the color of the rock aggregate mixed with the rock asphalt.

In the United States, asphalt pavements were as-



Two 330-hp. oil engines direct connected to 220-kw. generators in power plant.

View of power plant showing compressors and generating units.



Loading a car of pulverized rock asphalt for shipment.

sailed on the ground that they were slippery. This was, of course, in the days when horse-drawn traffic predominated. To establish their product in the face of such criticism, the asphalt interests caused an investigation to be made in ten American cities. The data secured during several months of observation led to the publication of the statement that horses fell more frequently on wood and on granite pavements than they did on asphalt ones. It was declared that, on an average, a horse would travel 583 miles on asphalt without an accident, as compared to 413 miles on granite, and 272 miles on wood blocks. It was also asserted that a horse could draw a heavier load over asphalt than over any other type of pavement then in use.

Asphalt is formed from the decomposition of organic matter, the theory being that petroleum or some similar product is first formed and that the lighter oils are subsequently driven off by natural destructive distillation—leaving the heavy residue of asphalt. Two series of hydrocarbons are contained in asphalt, the proportion of each varying according to the source of the product. To the constituent which gives asphalt its viscousness and its adhesive qualities chemists have given the name petrolene. The other constituent—called asphaltene—imparts hardness, which is an essential quality in paving. It is generally considered that asphalt containing approximately 30 per cent asphaltene and 70 per cent petrolene makes a satisfactory pavement.

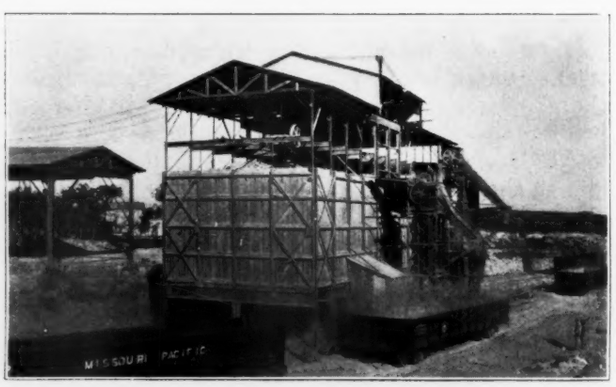
The most important rock-asphalt deposits in Texas are in Uvalde County, about 110 miles from San Antonio. They lie close to the surface, in a broad synclinorium or saucer-shaped structure of sedimentary rock, in close association with masses of igneous rock whose intrusion probably furnished the heat that drove off the more volatile components of the original petroleum deposit and left the heavy asphalt. At some stage in the geologic process, pressure—imparted by folding of the strata or by other means—forced the asphalt into one stratum of the horizontally-disposed sedimentary series, impregnating the rock so that it is now a mottled gray, the spots representing free asphalt.

The rock aggregate of the Uvalde deposits is limestone, which well meets the requirements of a road-building material. In this respect, it is similar to the better known European product. The Kentucky rock asphalt, on the other hand, is an impregnated sandstone.

The Uvalde deposits were opened up in 1894, and the first shipments were of "litho-carbon," which consisted of bitumen extracted from the rock by treatment with naphtha. This product was of two classes—a hard gum, known as mastic, and a soft gum which was not entirely free of naphtha. In 1895, shipments totaled 450 tons, which sold for $50 a ton in New York. Following a 4-year period of inactivity, 825 tons were shipped in 1899, and 260 tons in 1900. Since the last-mentioned year, the bitumen has not been extracted, and the rock asphalt has been sold both in the crude form and pulverized.

In San Antonio and in other Texas cities there are pavements constructed from Uvalde rock asphalt that are still in good condition after more than 25 years of service. The material has been used in large quantities in recent years for both highways and streets. In Bexar County, Texas, alone, there are more than 500 miles of roads paved with it.

One of the principal operating companies in the Uvalde area is White's Uvalde Mines. This company, which is owned by R. L. White of San Antonio, controls the mineral rights of some 30,000 acres of land there. It has been producing rock asphalt since 1924. Its present center of activity

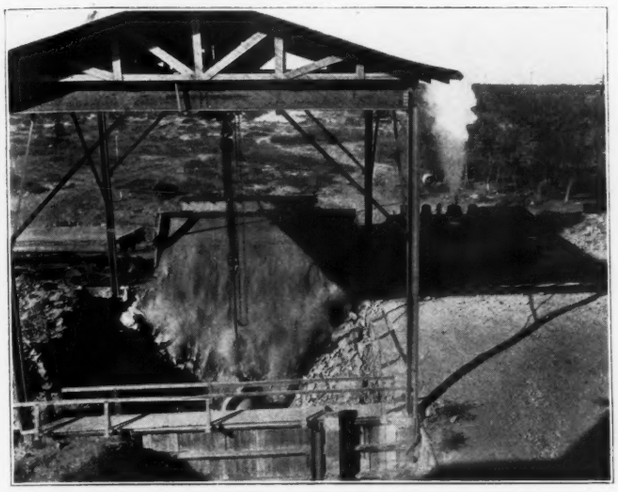


General view of crushing plant showing loading facilities.

is known as Mine No. 4, which was opened up about three years ago. The deposit being mined has been determined, by exploratory drilling, to be approximately 4,000 feet long, 1,000 feet wide, and from 65 to 85 feet thick. The operations consist of mining the rock and crushing it for shipment. The deposit is being worked from one end, and the crushing plant is established at the other end. This

permits advancing progressively toward the crushing plant and disposing of the waste and overburden behind the operations at all times.

The soil overburden is from 2 ft. to 4 ft. thick. This is stripped away with a Bucyrus-Erie Class 14 dragline equipped with a 100-ft. boom and a 2-cu.



Carload of rock asphalt being dumped into the primary crusher.

yd. bucket. Once the overlying mantle is removed, extraction of the rock asphalt is carried on by the bench method of quarrying. Three cuts, of approximately 21 ft. each, suffice to reach the bottom of the deposit at the point of present operations. The rock consists of about 10 to 12 per cent asphalt and of 88 to 90 per cent limestone. These proportions make a very satisfactory road-building material, so it can be seen that the natural forces which created the deposit worked in full accord with the prospective needs of man.

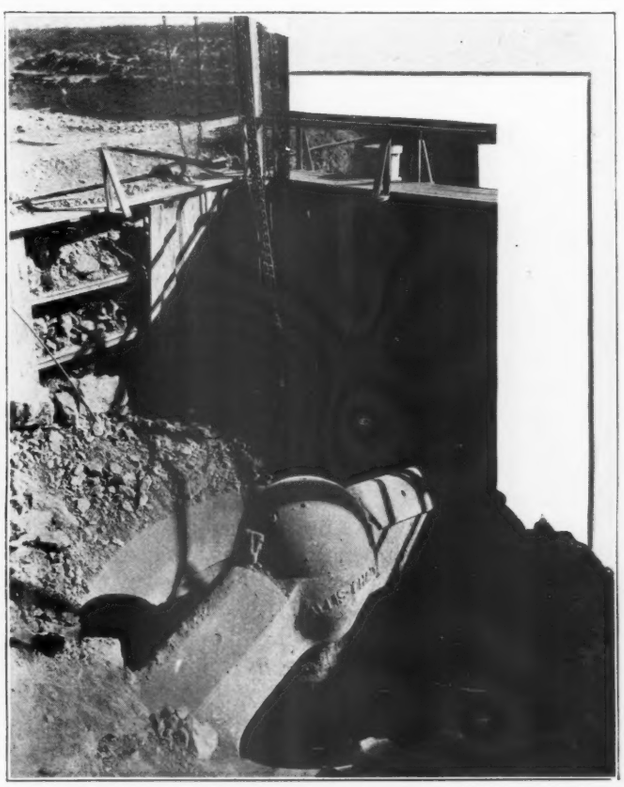
It goes without saying that the asphalt content of the rock complicates the drilling problem. It gums on the bit, and tends to plug the drill hole and to stall the drill rotation. Ingersoll-Rand Jackhamers were at first employed for all drilling. About two years ago it was decided to try mounted drills, and the Ingersoll-Rand X-71 type of drifter was selected as best suited for the purpose. The result was a remarkable gain in efficiency. The average footage made per drill per day was increased from 80 to 420. Because drifter drills use steels with larger bits it is possible to load the holes with more powder; and holes are now staggered on 6-ft. centers, as compared to 4-ft. centers when Jackhamers were utilized. Two skid-mounted X-71 drills do all the primary drilling. In putting down a 21-ft. hole, three changes of steel are made—the sequence being 8, 16, and 22-ft. lengths. The gages of the bits on these are, respectively, 2, 1⅞, and 1¾ in.

The Ingersoll-Rand X-71 is a wet drill. To overcome the tendency of the asphalt in the drill cuttings to plug the water passage in the steel, the normal opening in the center of the bit is forged up solid. A hole is then drilled from the side of the bit to meet the central passage. This hole is placed in one of the grooves between the wings of the bit and about 3 in. above the cutting face. This type of steel has been successful in maintaining an uninterrupted flow of water to wash away the cuttings.

Blasting is done with 60-per cent dynamite in sticks of 8 in. by 1½ in. Three rows of holes are generally shot at a time. The charge is balanced —eighteen sticks being ordinarily used in the back row of holes and from eight to twelve sticks in the front and intermediate rows. About ½ lb. of explosive is required per ton of rock taken out. Large boulders brought down are block-holed with BCR-430 and BAR-33 Jackhamers to facilitate handling. Mexican labor is employed almost exclusively on the drills.

A standard-gauge railroad, about three-quarters of a mile long, connects the quarry with the crushing plant. Side-dump cars of 16-cu. yd. capacity do the hauling. Two steam locomotives, one of 33 tons and one of 28 tons, alternate in this service. Two Bucyrus-Erie power shovels, carrying 2-cu. yd. dippers, are used for loading.

At the crushing plant the cars are dumped by means of an air-operated jack into an Allis-Chalmers 42-in. gyratory crusher, which has a capacity of 6,000 tons per 24 hours. The crusher is driven by Texropes from a 150-hp. motor. The crushed material is elevated into a bin which has a capacity of approximately 3,000 tons. This rock is either shipped as is and further reduced in size at the points where it is laid, or it is pulverized at the plant. Two pulverizers are provided for this purpose—a Williams Jumbo, which is direct driven by a 200-hp. motor, and a Williams Junior which is



The 42-in. gyratory crusher. Its capacity is 6,000 tons every 24 hours.

driven through a flexible coupling by a 150-hp. motor.

In laying the asphalt it is desirable to mix with it a small amount of asphaltic base oil which serves as a binding agent. Large contractors have their own mixers, but there are many small contractors who desire to secure a pre-mixed material that is ready for use when delivered to the job. To meet this demand, the company maintains a mixing plant at one end of the storage bin. The oil used contains not less than 50 per cent asphalt. One ton of rock asphalt will lay 20 square yards of pavement 1 in. thick.

All the electricity and compressed air used at the mine and the crushing plant are produced with oil-engine-driven units—the total installed horsepower in oil engines being 935. There are two Ingersoll-Rand Type PR, 330-hp., solid-injection engines, each of 3 cylinders, 17¾ in. by 22 in. Each is direct connected to a 220-kw. generator. The current generated is of 2,300 volts, 3 phase, and 60 cycles. This energy supplies the dragline and the electric shovel at the mine, the various motors at the crushing plant, and one motor for driving two auxiliary compressors in the power plant. The mine and the crushing plant are operated only one shift, and the generator units are shut down at night. To supply power for lights and other purposes, there is an Ingersoll-Rand PO, 55-hp. oil engine that drives a 35-kw. generator.

Compressed air is furnished by two Ingersoll-Rand Type POC-2, 110-hp., oil-engine-driven compressors, each of 603-cu. ft.-per-minute piston displacement. There are two spare compressors, either or both of which can be belted to a common line shafting that is driven from a motor. These are Class ER-1 machines, each of which has a piston displacement of 368 cu. ft. per minute. All these oil engines have operated practically without trouble since they were installed in March, 1926; and the annual repair bill on them is negligible.

A closed cooling-water system, with a tower for cooling the water before re-use, is provided. The source of the water is the pit of an abandoned mine, some distance away, from which it is pumped. By treating the water in a Duro softener, the content of solid material is greatly reduced, and very little scale forms in the engine cylinder jackets. It has been necessary to replace only one cylinder head on the engines since they were installed.

It is noteworthy that while there is a connected load of nearly 900 hp. in motors at the mine and the crushing plant, the work is conducted in such a manner that the 660 hp. in oil-engine generators takes care of the demands with very infrequent overloading. The load required for most of the operations is intermittent, and the various phases of the work are so timed that the 900 hp. of connected load is never needed at any one time. For example, while the gyratory crusher is in operation the electric shovel at the mine is idle, awaiting the return of the train of dump cars. By the time loading starts again at the mine the crusher has completed its work.

Drill-steel sharpening equipment consists of two Ingersoll-Rand sharpeners, a No. 33 and a No. 50, and of a No. 25 oil furnace. A pneumatic paving breaker has been ingeniously mounted on a frame above an anvil to form a hammer for light forging work.

Most of the material produced by White's Uvalde Mines is used in Texas and adjoining states. Frank Coughlin has served as general superintendent of the property since the present operations were started.

Hazards in Transporting Explosives

(Continued from page 35)

Vehicles and harness used for transporting explosives should always be kept in first-class repair. Do not run any risk of vehicles or harness breaking down.

The necessity for keeping vehicles in first-class repair is shown in the account of a recent accident while a truck was transporting explosives.

An automobile truck and trailer were used to transport 100 cases of 60-per cent gelatin dynamite and 270 kegs of black blasting powder over a main highway. Part of the trip was up a steep grade. The truck was of the chain-drive type with the foot brake operating on the sprocket wheel that drove the chain. The trailer was without brakes.

While driving up the steep grade the drive chain broke, rendering the foot brake useless, and the emergency brake failed to hold. The truck ran backwards into the trailer and caused the loads on the truck and trailer to be dumped into the highway. Several cases of gelatin dynamite were broken open and 113 kegs of black blasting powder were spilled. Seven of the kegs broke open spilling considerable black powder on the concrete road. Some of the kegs were dragged along the concrete and evidently sparks must have been given off, but fortunately the explosives were not ignited.

This accident shows the necessity for careful inspection of all vehicles before they are used to transport explosives. No truck should be allowed to carry explosives unless the truck is in safe working condition, especially as to brakes and as to protection of the explosive from heat or sparks from the engine of the truck.

In transporting explosives, railroads should be used whenever possible, especially when the haul is for any considerable distance; and in general, the old-fashioned mode of horse and wagon hauling is as yet the safest way to carry the explosive from the railroad to the storage magazine, and from the storage magazine to the distributing point at a safe distance from the mine opening. If trucks are used, the precautions recommended above or others equally effective should be taken to prevent explosions during surface transportation of explosives.

Acknowledgment

The authors are indebted to Dr. Charles E. Munroe, chief explosives chemist, U. S. Bureau of Mines, for suggestions made in reviewing this paper and for supplying a copy of the regulations used in the explosives division.

Methods and Cost of Producing Fluorspar at a Southern Illinois Mine*

By EDWIN C. REEDER
General Manager, Hillside Mine, Rosiclare, Ill.

THE mining methods described in this paper are those used in one of the large mines producing fluorspar in the Kentucky-Illinois fluorspar field, located in southern Illinois and western Kentucky on the Ohio River. The occurrence of ore and the methods of mining are similar to those in other mines in the district; therefore information regarding methods and the results obtained should be of interest. Improvements in methods have been made as experience developed the need of them.

The mine is situated at Rosiclare, Ill., on the Illinois Central Railroad, and shipments are made also by barge on the Ohio River.

The presence of fluorspar and galena in this field was known nearly 100 years ago, but no mining was attempted until 1842. In that year fluorspar and galena were discovered near the site of the present Rosiclare mine, and development of the deposit began. Up to 1905, Hardin County, Ill., was a small but consistent producer. Prior to 1893, almost all the shipments were of lead ore as the market for fluorspar was small and the fluorspar had little value. With the advent of the basic open-hearth steel furnace the real demand for fluorspar began and, with the growth of the steel industry, there has grown a market for fluorspar, the bulk of which is used for flux in the open-hearth furnace.

The geology of the fluorspar deposits is comparatively simple, and the veins usually outcrop at the surface. The underlying rocks are horizontal or slightly inclined beds of limestone, sandstone, and shale of Chester (Upper Mississippian) age, which have been extensively faulted and moved. There are a number of major faults that can be traced for long distances and are intersected by numerous small faults. The faults are, almost without exception, of the normal or gravity type.

In a number of places, dikes and sills of igneous rock cut the sediments, but none has, as yet, been exposed in the mine workings down to the lowest depth thus far opened.

Some of these fault fissures are mineralized with vein fillings of calcite, fluorspar, galena, and spalerite, with calcite the most common material. In the workable veins the fluorspar replaces the calcite either wholly or partially. There are a few areas in the district in which fluorspar has replaced beds of limestone overlain by impervious strata, forming tabular or bedded deposits tributary to fissures.

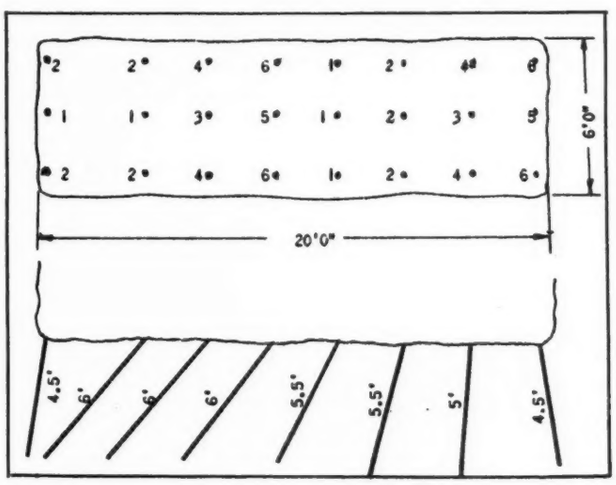
Many of the vein deposits terminate beneath a mantle of clay soil resulting from decomposition of limestone. In such cases insoluble lumps and grains of fluorspar are distributed through the clay in the form of a gravel deposit.

The vein in the mine we are about to describe is an extension of the Rosiclare fissure vein, with a general north-and-south strike and a dip almost vertical, though usually it dips to the west at a high angle.

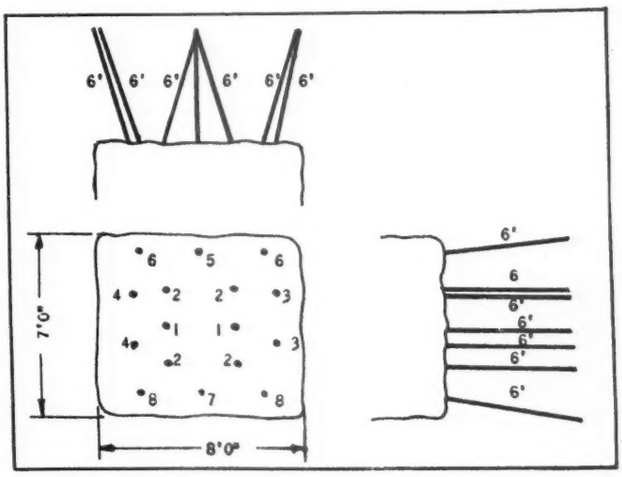
At the surface, the hanging wall is sandstone underlain by a bed of shale under which is a series of limestones. The footwall is limestone, and both walls below the shale bed mentioned are solid and strong and stand indefinitely when exposed to the air. The vein has been subjected to several post-mineral movements, marked by slickensides and brecciated areas in the ore. The vertical movement seems to have been as much as 125 ft., the hanging-wall having dropped, and the horizontal movement is nearly 500 ft. to the south.

The vein, in places, attains considerable width, the

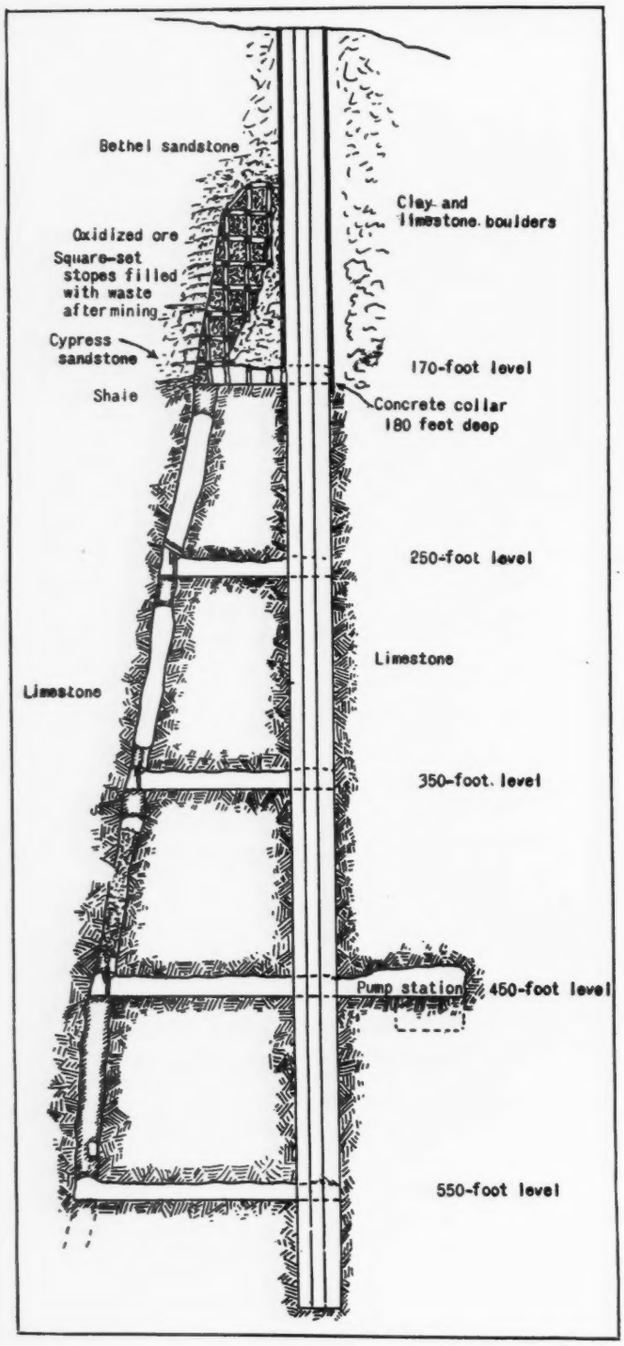
*Reprinted from U. S. Bureau of Mines Information Circular 6294.



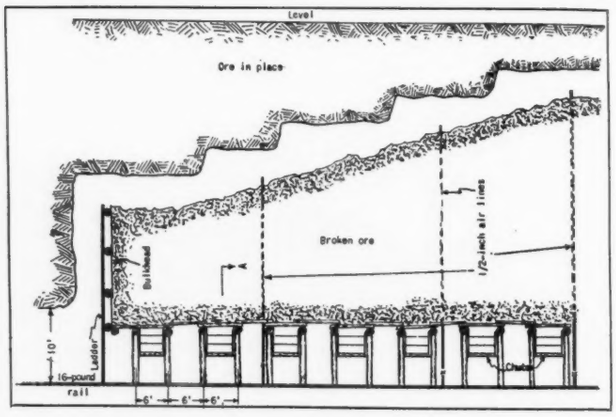
Standard round of drill-holes in shaft-sinking.



Standard V-cut round of drill-holes in orebody.



Sectional elevation through Hillside shaft and fluorspar vein.



Sectional elevation of stope along strike of the vein, showing stulls and chutes as used in narrow and short workings.

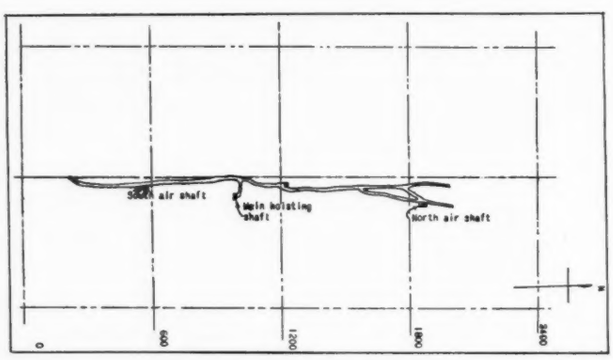
maximum being 34 ft., with widths of 18 to 20 ft. common, and the average about 12 ft. The length of the oreshoot in this mine is 1,900 ft. The orebody is practically continuous for its entire length and is usually mined out completely from level to level.

As the dip of the vein is uniform, the oreshoot can be projected from one level to the next with sufficient accuracy.

It is usual to prospect by drifting and crosscuts, winzes, and raises. Diamond drilling is used to a limited extent, both from surface and under ground. Surface diamond drilling is done to locate other veins and fissures, and usually inclined holes at 45 deg. inclination are drilled. Underground diamond-drill holes are driven to get information as to parallel veins. They are usually horizontal and have been drilled to a depth of 800 ft. Horizontal holes, in the limestone particularly, deflect badly on striking hard areas or flint bands, and unless the hole is surveyed the operators are in the dark as to where the hole actually is.

Drifting and crosscutting are done to open up new territory or to check up on diamond-drill discoveries.

It is not usual to attempt any sampling of underground works, as it is not difficult to estimate the grade of the ore by the eye. An ore-reserve estimate is made annually and, as the ore is of comparatively uniform grade, the estimate is made on tonnage only. Blocks of ground, opened by drifts, on two sides, and a raise or stope on the other, are considered as a uniform block, and the area of each drift and the distance between are used in calculating the cubic contents. Drifts in ore are usually carried the full width of the ore, and a figure of 10 cu. ft. per ton is used for estimating ore in place. Stopes are measured once a month, and areas of horizontal section are computed.



Plan of the 350-ft. level of the mine.

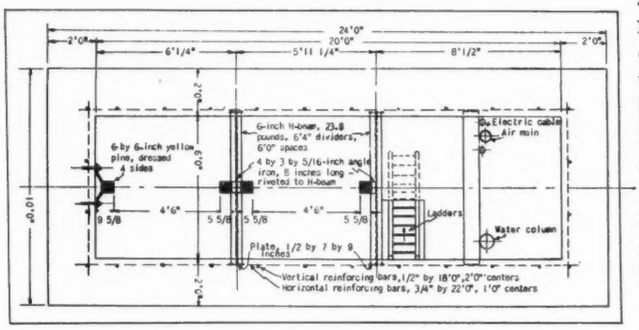
The mine is opened by means of one vertical hoisting shaft of four compartments and is producing, from five levels, at the rate of about 5,000 tons per month. The mine is operated on a single-shift basis. All ore is hoisted through the main shaft, which is located close to the mill, so that the skip dumps

directly into the mill bin at the top of the headframe.

The main vertical shaft, sunk in the footwall, is about midway of the orebody, and ore comes to the shaft from both sides.

There are two vertical air-shafts, the one at the north end having two compartments 5½ ft. by 6 ft. and a depth of 400 ft. This shaft has a cage road and ladderway and is equipped with an electric hoist for handling men and supplies, but no ore is hoisted. The south air-shaft is a single-compartment opening 5 ft. by 7 ft., and extending to the 250-ft. level; it is equipped with ladders and is used for ventilation and as an escapeway for emergencies.

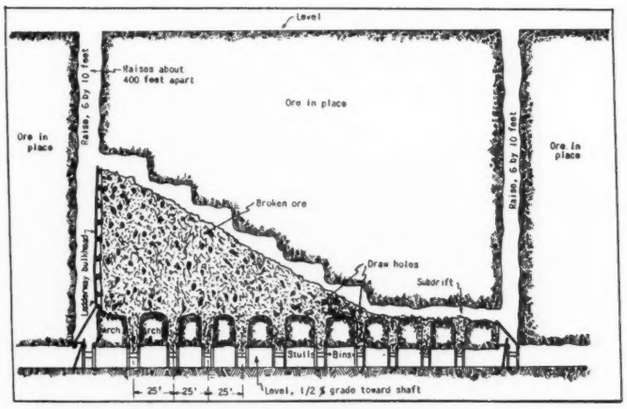
The main shaft is 6 ft. by 20 ft. in inside measurement and contains two hoisting compartments 5½ ft. by 6 ft., a ladderway and pipe compartment 8 ft. by 6 ft., and at present is 600 ft. deep. The long



Plan of the concrete collar, main hoisting shaft.

axis of the shaft is east and west and approximately at right angles to the vein, which is about 70 ft. from the shaft.

The west hoisting compartment is equipped with an ore skip, and a cage occupies the other hoisting compartment. The cage is weighted with concrete blocks to counterbalance the weight of the skip. The skip holds 3 tons of ore or 54 cu. ft., and is loaded from pockets at the different levels. The cage is a single-deck affair, and is used for hoisting waste in cars as well as men and supplies. The cage holds 14 men without crowding. This shaft is lined with concrete 2 ft. thick, reinforced with steel bars, extending from the surface to the solid limestone 180 ft.



Sectional elevation through a shrinkage stope.

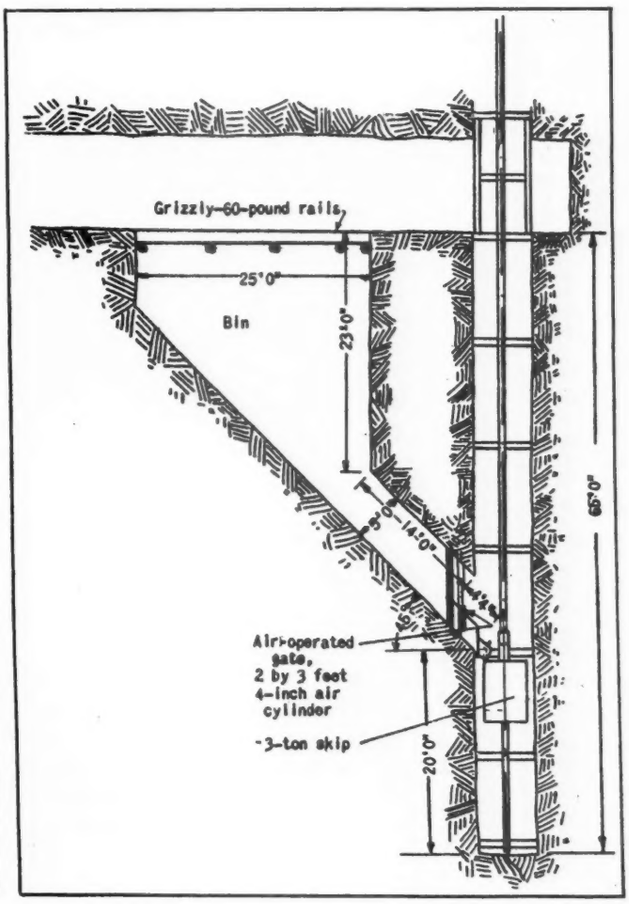
below. No timbers are used in the shaft below the concrete collar, with the exception of the guides and the dividers.

The first level is the 170, the next the 250, and then 350, 450 and 550. The 350, 450 and 550 levels have ore pockets with air-operated gates and chutes for loading the skip. All ore from the upper levels is dumped into raises and passed to lower levels where it is trammed to the shaft for hoisting.

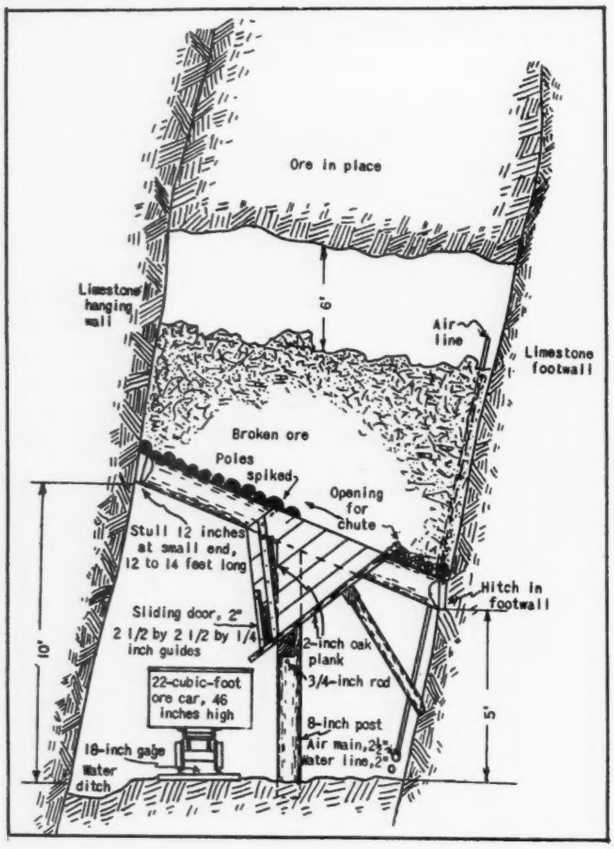
Shaft-sinking is done under a rock pentice, by a crew of local men, usually three on a shift, working two 8-hour shifts. A sinking hoist is set up in the station at the lowest level, and the broken rock from the shaft sinking is hoisted in 10-cu. ft. buckets and dumped into mine cars, which are run on the cage and taken to the surface or dumped into empty stopes.

All drilling is done with 57-lb. jackhammers, and 24 to 27 holes, 5½ ft. deep, are required to break a round which will advance about 4 ft. It is usual to drill and blast the cut in one end of the shaft and then to break the bench with the next round. Number 6 electric exploders, 1-5 delay, connected to a 220-volt lighting circuit, and 35-per cent gelatin dynamite are used to break the ground.

All drifts and crosscuts are nominally 7 ft. high by 8 ft. wide, and track is carried on a grade of 0.5 per cent in favor of the loads. Whenever possible, drifting and crosscutting are contracted and, below the



Typical ore pocket, on the 450-ft. level.



Stope section, showing use of stulls and lagging (instead of arches) and a chute.

170-ft. level, no timber is required except for ore chutes and bins. The machines used for drifting work are all of the one-man type, either the mounted jackhammer or the light drifter being satisfactory. Steel used is 1-in. hollow hexagon, with cross-bits made with 5-deg. and 14-deg. taper.

A standard wedge cut is used, and 15 holes are usually necessary to pull a full round which will break about 4 ft. This round does the best all-around work. The cut holes are loaded with six sticks each and the other holes with five sticks each of 1¼-in. by 8-in., 35-per cent ammonia gelatin. When drifting in spar, it will frequently not require as many holes to pull a round and, again, when the ground is calcite with limestone horses or boulders it may take a few more holes.

Each miner takes down his own steel. The dull steels are carried to the shaft station, and the skip tender takes them up to the surface. Very little trouble is experienced with drill steel, the principal trouble being due to steel breakage.

Standard raises are 5 ft. by 7 ft. in area and are driven on contract. A hand-rotated "dry" stoper using 1-in. solid hexagon steel is the machine used for drilling. Raises are usually driven by one miner and, if the raise goes up over 50 ft., he is given a helper. No timbering is required, the miner putting in his own working poles and scaffold planks. A wedge cut is used, and a round usually breaks 3½ ft. to 4 ft. After a raise is up about three or four rounds, the timbermen put in two stulls over the level and build a bin between so that no shoveling is required.

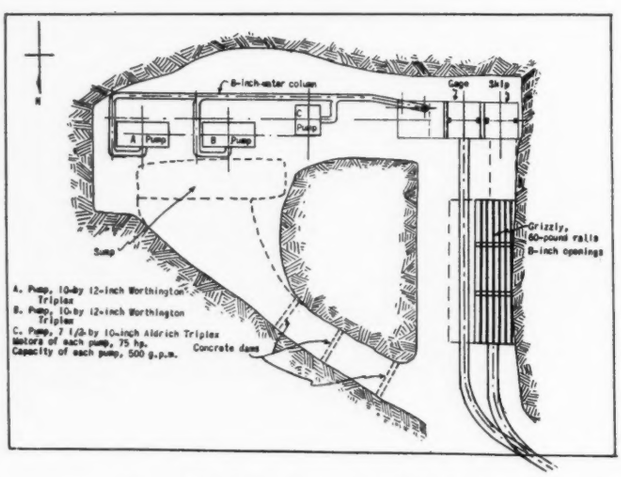
All material is pulled up the raises by a hand line, and the line of working poles on each end of the raise forms the only way of getting up and down until the raise is finished. Naturally, anybody who is not able to "coon" his way up these poles has no business in a raise.

When opening a new stope the bin raises are spaced at 25 ft. centers and are driven high enough to allow a subdrift to be started over the level pillar to connect the tops of the raises. These subdrifts are slabbed out to the full width of the vein and, from then on, stoping upward begins.

The straight shrinkage system is used. Stoping is started after the drift has advanced in ore a sufficient distance to clear the way so that the chute raises can be put up and the bins built in them.

There is no set length for stopes. They may vary from one hundred to several hundred feet in length, depending on several factors, such as the location of through raises to the level above, the position of a pinch in the vein or a horse of rock, or how badly the ore is needed. The ideal condition is one in which the drift is kept far enough ahead of the stope so that a long stope can be carried up and numerous bulkheads can be avoided, better ventilation will be possible, and the slope of the ore fill in the stope will not become too steep. The back of the stope is carried in steps, the faces of which are advanced from one end of the stope to the other; usually several faces are worked at once. Sometimes when a raise is available or a high step, instead of using the customary upper holes, jackhammers are employed and long flat holes are drilled. Often it is possible to put in flat holes 12 ft. or 15 ft. deep, and a lot of ore can be broken cheaply and quickly. When the stopes are very wide, this system of flat holes is effective and produces much less fines in the broken ore than the vertical-hole method of blasting.

As the stope is carried upward the increase in volume of the broken ore makes available considerable tonnage, which must be drawn off every day to give the miners room to work. The volume of the broken ore is nearly double that of the ore in place, and the top of the ore pile is kept about 6 or 7 feet



Plan of shaft station on the 450-ft. level.

below the back, which gives the miners room to drill. At the same time, they can work all loose ground and take it down before it drops and hurts someone. Arches are usually left 1 ft. deep, for each foot in width, up to a depth of 15 ft., which seems to be deep enough to carry the load at the widest places (34 feet). Where the orebody is very narrow and short, the broken ore is carried on stull timbers instead of arches. As the walls are strong and solid, the floor and stope arches have no side pressure to withstand, and when the stopes are emptied of their content of broken ore the arches are mined out and dropped into the stope below. When drawing out the broken ore from a completed stope, it is customary to trim down the walls, and large slabs of limestone on the walls are kept from falling by heading light stulls against them, which secures them until the stope is emptied and abandoned. In this system of mining, it is easy to leave areas of barren ground and go around them. No filling is used in the shrinkage stopes, and these open stopes, sometimes 200 ft. high or more, stand open for years.

From the surface down to the 170-ft. level, the ground is oxidized and leached, and practically all calcite in the vein has disappeared leaving the spar with a gangue of stiff, red clay. The walls of the vein have also largely disappeared, leaving boulders of rock imbedded in the clay. The method of mining this level is that of square sets and fill.

The orebody is quite wide, measuring from 20 ft. to over 40 ft. The main drift is in the footwall, back far enough to be safe from the crushing of the soft moving ground. Short crosscuts reach the ore, and stopes are carried across the ore to the hanging wall. These stopes are usually carried two sets long and the full width of the ore and are timbered with round timbers framed to a standard size of 6-ft. centers on the caps and girts and 6 ft. 4 in. for the posts. The logs from which the sets are framed measure 10 in. to 12 in. in diameter and are hardwood, grown locally, being mostly red and white oak and hickory. Lagging is either of 4-in. round poles or split poles 6 in. to 8 in. in diameter.

Filling is obtained from the walls by short crosscuts, and all open sets are filled up tight as fast as mined out. Usually one set is left open for an ore-pass and another for a manway, and the timbered stopes are carried up in the ore a distance 11 to 12 floors high or about 70 ft. When the stope is mined out and filled with waste, the miners begin at the sill floor of another one alongside the old stope.

In driving crosscuts in the walls for filling, the broken material is handled by compressed-air tugger hoists which drag the waste into the stope.

About 25 per cent of all ore hoisted comes from the square-set stopes.

All ore hoisted to the surface is loaded into the skip from pockets on the 350, 450 and 550 levels. Ore from levels above the 350 level is sent down by ore-passes and trammed to the skip pocket. All ore is trammed by hand, as tramming distances are short, the longest being about 900 ft., and the average tram about 500 ft. All tracks are 18-in. gauge and laid with 16-lb. rail. All ore cars are 22-cu. ft. capacity, rotary end-dump type equipped with 12-in. roller-bearing wheels and axles. Grades are in favor of the loads, and two men are assigned to a car.

Stope chutes have wooden slide-gates opened with bars by the trammer. The chutes on the skip pockets have vertical slide-gates operated by air cylinders.

In regular shrinkage stoping, all mineral-bearing material is removed from wall to wall. Whatever is left in pillars is too low grade to be considered as ore. If it is possible to do so, all floor arches and stope arches also are taken out. In the square-set stopes, the only material left is that which has too little mineral to be classified as ore.

A limited amount of waste is sorted underground at the grizzlies over the skip pockets, and the coarse waste is rejected there before entering the bins. As all ore entering the mill is sorted on a picking belt, waste is rejected there also.

The mine is ventilated by natural means, with the air shafts at the extreme ends of the mine and the main hoisting shaft in the middle. During the summer, when hot weather makes the natural air currents sluggish, a small fan is used to help the ventilation on the 170 level where the small drifts and timber impede the air currents.

Although the temperature underground is always satisfactory in summer the humidity approaches the saturation point.

A motor-driven fan is installed on the surface at the south air-shaft and blows 6,000 cu. ft. of air per minute to the 170 level, and doors and bulkheads direct the air current to the working places.

The increased velocity of the air has bettered the morale of the miners, has speeded up the work, and made considerable difference in the rate of decay of timber in the drifts and haulageways, with a noticeable decrease in the fungus growth.

Labor conditions are good. All labor is white, and of American stock, so the problem of handling aliens who can not speak English is not present. The company wage scale is as follows for an 8-hour day: muckers and trammers, $3.50; stope miners, $4.00; drift miners, $4.50; timbermen, $4.50; pumpmen, $4.50; hoistmen, $4.50. As much underground work as possible is done by contract, either on a tonnage or footage basis.

Raising and drifting are on footage contracts. Helpers working for contractors are paid by the company at company wages.

The usual rate for raising in ore is $3 per ft. for labor. After a raise is up 50 ft., a helper is furnished by the company. It is not usual to raise more than 100 ft., and the ordinary size is 5 ft. by 7 ft. in area. The company timbermen build the ore-bin as soon as there is room enough.

For a drift in ore 7 ft. high by 8 ft. wide, the usual price per foot is $3 for one man. If he needs a helper, he is charged with the cost of the labor. Mucking and tramming are either done by day-pay or contract, at a set price per car, depending on conditions and ranging from 20c to 40c per car of 22 cu. ft. On some contracts, the contractor is required to furnish his own powder, caps and fuse, but this

(Continued on page 50)

Montana Copper Firm Develops Novel Type of Underground Quarry*

High-Analysis Limestone Is Excavated by Glory-Holing in a Steep, Massive Bed

By P. F. MINISTER

AT Lime Spur, Mont., the East Butte Copper Mining Co. has been quarrying limestone for twenty years. The quarry is beside the Northern Pacific Railroad in the Jefferson River canyon, 4½ miles east of Cardwell.

History

This quarry was opened early in 1900 by Dan Morrison, the discoverer of the Morrison cave, to supply a demand for smelter flux. As no particular effort was made at the quarry to select the rock, that delivered to the smelters was unduly high in magnesia and impurities. The East Butte company, therefore, bought the quarry in 1909 and confined operations to the high-grade beds in order to supply rock of the desired purity for its own smelter and the Butte Reduction Works until the latter shut down. It also developed a market for some of its rock with the sugar factories. The latter market increased until in later years all rock larger than 4 in. in size over a bar grizzly was shipped to the sugar factories, and the rocks smaller than 4 in. were used as a flux in the blast furnaces at the Pittsmont smelter. In 1924, the East Butte concluded a contract with the Anaconda company for the treatment of its ores, and the Pittsmont smelter was shut down, which made the minus-4-in. rock a useless by-product. Since there was not enough revenue in the sugar rock alone and also because of limited waste room, it became necessary, if Lime Spur were to continue to operate, to increase the proportion of plus-4-in. rock and to develop a market for the minus-4-in.

The plus-4-in. rock was increased by the elimination of all crushing until after the separation of sugar rock, any necessary breaking of large boulders being done by men with 16-lb. hammers and by bulldozing, by using more care in the primary blasting, and by taking advantage of seams and cracks. Originally the small rock constituted 60 to 65 per cent of the production: today it amounts to 44 per cent. Fifty per cent of the reduction, however, can be attributed to a reduction in minimum size to 3 in. allowed by the sugar factory.

In order to develop a market for the minus-4-in., a crushing and screening plant to size this rock for concrete aggregate and road construction was added to the original plant. This plant produces minus-2½-in. and minus-1½-in. rock and eliminates all of the minus-⅛-in. Special sizes are obtained by rescreening at Butte. This rock is used extensively in most of the construction and road building around Butte.

The quarry has produced, since the East Butte acquired ownership, 1,200,000 tons of rock. At the present time, production amounts to 30,000 tons annually, of which 56 per cent of plus-3-in. is sold to the sugar factories and 44 per cent of minus-3-in. is sold as concrete aggregate after sizing. At times, on account of its purity, limestone is sold to a glass factory at Lovell, Wyo. A year's shipments to the sugar factories average 98.0 per cent plus of $CaCO_3$. The concrete aggregate is acceptable to, and passes all Federal-aid specifications for highway and bridge construction.

General Geology

At Lime Spur and vicinity, in the Jefferson range, there is a fault block about 3 mi. by 4 mi. in area, exposing the Madison and overlying Quadrant and Ellis formations, which have been folded by pressure from the north into a great arch, with axis trending southwest by west. It is bounded on the north by an overthrust fault, on the north side of which is the Belt formation, and on the east and south sides by another overthrust fault, on the east and south side of which are, respectively, the Three Forks formation, of Devonian age, and the Livingston formation, of Cretaceous age. The Jefferson river here has cut a deep canyon in the north limb of the arch through the Ellis and Quadrant formations and into the Madison, the beds of which strike N. 70 deg. to 45 deg. E., thus forming prominent cliffs of Madison limestone on both sides of the river. The Madison formation consists of 325 ft. of laminated limestone at the base, then 350 ft. of massively bedded limestone, then 575 ft. of jaspery cherty limestone at the top. The Lime Spur quarry is in one of the upper beds of the massively-bedded portion.

In the west half of the quarry, the beds strike N. 70 deg. E., but midway they commence to swing until they now strike N. 45 deg. E. in the east end of the workings. The general average dip is 40 deg. northwest. The bottom part of the cliff face

Limestone quarries that are worked in the open are familiar to nearly everybody. An occasional quarryman has been obliged to follow his beds of limestone under deep cover and to employ an underground mining scheme, usually some sort of room-and-pillar system.

The practice described in the accompanying article is probably unique. Its explanation should prove interesting to the majority of operators, not only in the contemplation of their good fortune in possessing flat, exposed formations but in showing them what can be done under adverse natural conditions.—Editor.

* From a paper read before the Butte (Mont.) Section, Amer. Inst. of Min. Eng.

at the quarry consists of alternating, relatively thin beds of high calcium and dolomitic or magnesian limestone. Some of these dolomitic beds are cherty. Above these beds is a single massive bed of nearly pure calcium carbonate from 90 to 100 ft. thick. Overlying this is a massive bed of dolomitic limestone and then above this comes the jaspery portion of the Madison. The 90 ft. to 100 ft. bed of pure limestone is the one which is being quarried. It should be noted here that there are occasional thin discontinuous beds and lenses of magnesium limestone distributed sparsely throughout this bed. For this reason a man must be stationed in the railroad car into which sugar rock is being loaded to throw out any impure limestone which may find its way into the car.

Following is a typical analysis of the pure limestone:

$CaCO_3$	98.0 per cent
$MgCO_3$	1.3 per cent
Fe_2O_3, Al_2O_3	0.3 per cent
SiO_2	0.4 per cent
Total	100.0 per cent

There are numerous faults all, however, of small movement with the exception of one which has a throw of 30 ft. perpendicular to the beds. The faults show no gouge and practically no breccia, and are recognized simply by a crack $\frac{1}{16}$ in. wide and the abrupt stopping and offset of the beds. Drifting requires careful watching and occasional test crosscuts to make sure that the drift is upon the right bed.

Quarry Methods

In opening the quarry and its subsequent working, the surface topography, the dip of the bed, and the chemical composition of the beds all had their influence. Since the use of the rock was for flux and sugar factories, quarrying had to be confined to the pure high-calcium limestone beds, and since the face of the cliff was composed of undesirable dolomitic limestone and the pure limestone lay behind, the ordinary bench method straight into the face of the cliff was precluded. A gulch at the west end of the quarry gave access to the pure bed at this point; however, in order to acquire capacity, it was necessary to open the bed at two other points also, one back of the crusher plant and one opposite the loading trestle. This was done by driving cross-cuts through the poor rock in the face of the cliff to the footwall of the pure limestone bed and then driving raises to surface in the pure stone which, at these points, had little overburden on the outcrop. Also the surface of the outcrop had a slope of about 30 deg. so that there was little overhang from the overlying beds. On completion of the raises the pure limestone was benched down into the raises and a regular glory-hole method of quarrying was established.

As quarrying progressed and the rock was broken out to the bottom of the raises, drifts were extended along the footwall of the pure limestone bed, and quarrying proceeded by advancing the conical sides of the glory holes along the strike of the bed. The rock was loaded into cars from the top of the drift timbers through stop boards. An identical procedure was followed where the gulch gave access to the bed at the west end of the quarry.

As the western and middle sections were quarried out and the quarry advanced to the east, the beds commenced to swing stronger to the northeast, as described, and the face of the cliff became higher and steeper, so that, eventually, as the pure rock was removed, a dangerous overhang of the cliff was developed. The edge of this brow was broken off for a time and sent to waste. However, as further advance to the east was made, the amount necessary to send to waste became so great that it no longer was economical. The company was then faced with the question of quitting the quarry or going to underground methods. The latter course was followed and the system which is now employed worked out.

This system might be called an underground glory hole. It consists in driving a drift along the footwall contact of the pure bed and then, from this drift, driving raises at intervals of 360 ft. directly up the dip of the bed, on top of the footwall contact, to the surface on the face of the cliff. At the start of a raise, a bin and grizzly, with capacity for two railroad cars of broken rock, is excavated and constructed at the bottom end of the raise in order that the broken rock from the raise and from quarry operations may be loaded into the quarry cars. After the raise has holed out to surface, the miners drop down approximately 30 ft. from the top of the raise and commence to widen out at the sides and top. This widening-out process is continued and expanded somewhat in the shape of a fan until the hanging-wall contact of the pure limestone is reached. This undercuts the face of the cliff and leaves a pillar to support the brow or point of the overlying dolomitic limestone. Openings are driven at intervals through this pillar in order to admit daylight and give proper ventilation. After this undercutting is completed, the miners drop down again to the raise to develop the regular incline method of benching the rock, as used in the open quarry. From this point on, benching continues from the top of the raise on down and, as rock is excavated, a great cavern is eventually developed. This process is continued until all rock is excavated down to the grizzly level over the bin, at the bottom of the raise.

A flow-sheet of the quarry would be described as follows. The limestone is drilled and blasted loose in the glory hole at the top of the raise; is bulldozed if necessary; then slides down the raise; is broken with sledges through a grizzly of rails, with 10-in. opening, over the bin at the bottom of the raise; loaded through a chute into 6-ton quarry cars; hauled with a 3-ton gasoline locomotive to a receiving bin (25-ton capacity); broken through a rail grizzly with 7-in. opening over the top of this bin; fed from this bin upon a conveyor belt and passed through a revolving grizzly with 3-in. opening,

where the rock for the sugar factories is separated from the undersize. The oversize drops directly into a railroad car where a man throws out any impure limestone that may come over. The car, when loaded, is shipped direct to the sugar factory. The undersize passes through the bar trommel upon a conveyor, is discharged into a revolving trommel equipped with suitable screens for removing the minus-⅛-in., which goes to waste, and for producing the desired size of rock for concrete aggregate. From this trommel the oversize goes to a gyratory crusher in closed circuit and the undersize drops to conveyors and is either loaded in railroad cars direct for shipment, or is sent out to storage for future sale.

Primary and Secondary Breaking of the Rock

The method of quarrying is by an inclined bench advanced laterally and upward toward the hanging wall from the raise on the footwall at an inclination of 38 to 40 deg., which is slightly in excess of the angle of repose of the broken rock. In starting a bench, the miners blast out the neck of the raise until a face 10 ft. or 12 ft. high is developed. They then drill holes into this face, from 15 ft. to 25 ft. in depth, depending on the position of slips and cracks in the rock. These holes usually have a burden of 12 ft. to 15 ft. on their bottoms. The holes then are chambered by successive charges of 3, 6, 10, and, if necessary, more sticks of powder, until the bottom will hold the amount of powder that is judged will be necessary to break the rock loose. Holes, after final loading, are thoroughly plugged with tamping. Holes are usually drilled in groups of 4 to 6 and are fired simultaneously by an electric battery. This bench is then advanced up the incline until the limits of the glory hole are reached. This primary blasting, of course, breaks out many large boulders and, for this reason, the raise is kept full of rock so that the boulders may be drilled, blasted, and broken the second time before they get down into the raise. The endeavor is to reduce these boulders in the quarry to a small enough size to be easily broken by a hammer on the grizzly at the bottom of the raise.

The annual rate of powder consumption, including that used in quarrying proper and that used in development work, is one pound to every three tons of rock produced. The production of finished stone, taking into account all labor employed in the completed quarry operation, is ten tons per man.

The utilization of undersize stone is an important problem for a quarry which is producing limestone for a sugar factory or for lime manufacturing. These industries do not want stone under 4-in. size, and usually 30 to 60 per cent of the rock produced is minus-4-in. The difficulty with using small stone in the shaft kiln is insufficient draught and burning spaces of insufficient size. Of course, sale of this rock as crushed stone or for other uses affords some relief, but often this is not enough. A proposed solution has been the burning of this rock in a rotary kiln, which is being done to some extent. However, the investment is heavy, efficiency of operation is lower, and the quality of lime produced not so good, as it slacks rapidly after burning. Modification of the shaft kilns has also been proposed, such as lower, wider kilns. Shaft kilns have proved to be most efficient and to produce the better product and, since they are already standard equipment at nearly all lime plants, any solution of the problem that will permit of the burning of small stone in these kilns will be of great assistance to the lime and limestone industries.

Methods of Producing Floruspar

(*Continued from page 47*)

depends on the location of his working place in the mine. The mining of the soft ground in the square-set stopes on the 170 level is all done by contract at a price of $2.25 per car dumped into the ore-pass. This price includes mining the ore, tramming to the ore-pass, timbering the stope, and filling with waste from crosscuts in the walls. The contractors pay for powder, caps and fuse, but timber is furnished by the company, framed to standard size ready for use. The contractor has to move his own timber from the timber yard on the surface to his working place.

In measuring up the square-set stopes for payment, contractors are allowed 20 cars of ore per set. The engineer's stope books are brought up to date twice a month. All work is measured up by the engineering department twice a month, on the 1st and 15th, and the men are paid on the 5th and 20th of the month.

Very little timber is used in the mine outside the 170 level, and all scrap timber is brought to the surface for disposal. The main shaft is lined with concrete for 180 ft. from the surface and, below that, the only timber used is for the guides and the dividers that support them. The main air-shaft is constructed similarly. Both shafts are wet, and all the levels have more or less water dripping. All electric wiring is put in according to best practice for precaution against short circuits and is inspected weekly.

The operation is not large enough to justify the services of a safety engineer, but his duties are performed in part by the mine engineer, and regular inspections and reports are made. First-aid training is given to regular classes of the men by the Bureau of Mines rescue car which visits the district regularly.

A safety committee, consisting of the heads of the departments and the superintendent and mine engineer, meets regularly and discusses and acts upon all reports and recommendations of the safety engineer. This work has been of great benefit in decreasing the number and severity of accidents.

The total operating costs per ton may be classified as follows: development, $0.383; mining, $1.270; underground transportation, $0.399; general underground expense, $0.404; surface expenses directly applicable to underground operation. $0.138. This total mining cost—$2.60—may be distributed also as follows: labor, $1.773; supervision, $0.051; drilling air and steel, $0.144; power, $0.138; explosives. $0.301; timber, $0.082; other supplies, $0.111.

Prevention of Blinding Accidents Should Be a Major Safety-First Item

Director of National Organization Gives Data on the Effective Use of Goggles

HOW more than 10,000 eyes and at least $46,000,000 were saved in two recent years among 583 plants, employing a total of half a million workmen, is told in the report of a study entitled "Eyes Saved in Industry," published recently by the National Society for the Prevention of Blindness and the National Safety Council. The two organizations set out to discover the total of authenticated cases of workmen's eyes saved from serious injury or destruction through the use of goggles or headmasks. As these figures apply only to corporations with definite records, there can be only conjecture as to the number of eyes actually saved by protective devices in all American industry.

The survey analyzes the records kept by the corporations during 1926 and 1927, disclosing that, in addition to the financial economy, 2,757 men and women were saved from serious injury or total blindness in both eyes during the two years. There were 4,654 recorded instances of workmen being saved from a similar fate to one eye, making a total of 10,168 eyes saved from destruction or serious injury.

"In this study, the first of its kind ever made," explained Lewis H. Carris, managing director of the National Society for the Prevention of Blindness, "it was assumed that an object which hit a goggle lens with such force as to pierce or shatter the lens would most certainly have so damaged the eye, if the goggles had not been worn, as to cause complete or nearly complete loss of vision. It was assumed, further, that every instance of a goggle lens bespattered by molten metal or by corrosive or otherwise injurious chemicals, represented an eye saved.

"The increase in the use of destructive chemicals in industry during recent years is reflected in the data from miscellaneous manufacturing plants which recorded the spattering of both lenses with molten metal or injurious chemicals in the case of one employee out of every hundred in the industry within a year. In practically all these instances the glass lens was so badly damaged by chemicals or molten metal that it had to be replaced. Often, even the frame of the goggles or the entire headmask had to be discarded.

"Much has been said concerning the number of eyes lost in industry, the cost of industrial eye injuries, and the extent of blindness attributable to the eye hazards of industrial occupations. Little has been said concerning the number of eyes saved in industry, the economic gain of this saving to employer, employee and nation, or the extent to which blindness from industrial causes may be averted. Little has been said concerning these matters because practically no authentic data covering the experience of any large group of industries were available until this study was made.

"It is, of course, impossible to interpret accurately, in terms of dollars, the cost of blindness, or the gain resulting from concrete instances of prevention of blindness. Workmen's compensation laws, however, set certain arbitrary values on sight; and the experience of insurance companies and of large numbers of employers has provided a formula for arriving at estimates of the incidental cost of industrial accidents. It is, therefore, possible to arrive at some conclusions concerning the economic saving to industry, to employees, and to the country at large resulting from the saving of eyes recorded in this study.

"The eye hazards of industry have come to be one of the most serious causes of blindness in America. There is, in fact, considerable ground for the belief that, each year, more persons are permanently robbed of their sight by occupational hazards than by any other major cause of blindness. This is due largely to the fact that innumerable persons—employers and employees alike—still do not realize or do not believe that it is possible to prevent accidental eye injuries in the particular occupations in which they are engaged. It is due also to the failure on the part of employers or employees and communities at large to appreciate the tremendous financial loss resulting from the blinding of men and women in industry.

"Despite the splendid accomplishments of many individual firms in the prevention of accidents in general, and specifically in the prevention of eye accidents, such accidents are still considered by many persons inherent or unavoidable accompaniments of certain industrial processes. Despite the tremendous financial savings through accident prevention publicly and authentically reported by some of the leading industrial concerns of America, there still are thousands of employers who regard, as an unavoidable (though evil) necessity, the payment of thousands upon thousands of dollars for the destruction or injury of the eyes of their employees.

"That these are misconceptions, that industrial eye injuries are largely preventable, and that their prevention is productive of enormous savings to employer, employee and the nation, are convincingly demonstrated in the findings of this study and the interpretation of their significance.

"The saving of sight referred to in the study is necessarily largely hypothetical. Anyone acquainted with industrial processes, however, will realize that these recorded instances of the prevention of blindness and serious injury represent only

(Continued on page 54)

Welding and Cutting Reduce Plant Costs in Pit and Quarry Industries

Oxygen-Acetylene Process Proving Its Worth by Adding to Life of Machinery

By RICHARD TULL
Linde Air Products Co

FOR pit and quarry machinery — equipment which by its very nature is subject to extraordinary wear and hard usage — there is no single maintenance method as widely adaptable and as generally economical as the oxy-acetylene process of welding and cutting.

This process makes possible the repair of all kinds of metal objects. By fusing fractured parts into a single piece, it makes the part repaired as strong as, or stronger than, it was when new.

For instance, a Western cement company faced a serious delay in production when a steam cylinder on one of its locomotives broke. This cylinder was 17 in. in diameter with a 24-in. barrel. The break extended longitudinally through the outer wall of the cylinder, the over-all length being about 32 in. (see Fig. 1). An attempt was made to repair the damage by bolting a curved plate to the cylinder wall and shrinking rings on the cylinder flanges. The result was not satisfactory.

Under the direction of a service operator, who gave expert advice and instruction, the plant welder, using bronze-welding rod, restored the cylinder to perfect condition. The first step in the repair was to make a 45-deg. V with a cutting blowpipe along the edge of the fracture and to countersink the 48 bolt-holes which had to be filled in. Without removing the cylinder from the engine, a temporary fire-brick furnace was constructed and the cylinder preheated. Then, when the cylinder had been brought to the proper temperature, bronze-welding was started. The welding blowpipe was in continuous operation for 8½ hr. Fig. 2 shows the completed bronze-weld and the cylinder ready for service. Although, with the assistance of the service operator, this repair was not especially difficult, it would have been much easier had the service operator been consulted before bolting was attempted. If this had been done, it would have been unnecessary for the welder to fill the 48 bolt-holes before making the repair itself.

Fig. 1. Cracked cylinder to be reclaimed by welders.

Another repair, even more remarkable from the standpoint of size, was performed recently by a Pacific Coast crushed-stone company. One of its 55-ton rock crushers had been fractured in several places for two years, but had been kept in service by makeshift braces and bolts. These repairs had cost several thousand dollars but were extremely unsatisfactory. The owners had heard of the advantages of oxy-acetylene welding but, because the crusher was so large and the repairs would have to be made chiefly in cast iron, they believed that the work could not be done by oxwelding. Upon the advice of a business associate, however, they asked a service operator to look over the job and to advise them whether or not it could be done by this process. The operator declared that, except for its size, the repair presented no particular difficulty. The owners gave the work to a contract welder, who assisted by the oxy-acetylene service operator, restored the crusher to perfect condition.

Fig. 2. Cylinder in perfect condition after bronze welding.

The crusher was fractured in several places. All the smaller parts were V-cut with a blowpipe and were welded into a solid piece; then this piece was placed in proper position and welded to the rest of the casting. This work required almost half a ton of bronze-welding rod. In addition to this, considerable welding was done on heavy steel. Fig. 3 gives some idea of the size and number of welds that had to be made. Much of this work had to be done from awkward positions because the casting

was too heavy to be moved about. After the welding was completed, the original braces were restored and reinforced with several hundred pounds of zinc. By doing this, the welds were relieved of part of the stress, although they were strong enough to take the entire load unaided. At present, the crusher is performing satisfactorily. The owners, having saved several thousand dollars in replacement, are thoroughly satisfied with the job. Their only regret is that they did not attempt welding at the outset, because the entire welding work cost hardly more than half of what the makeshift repairs had cost.

Another outstanding repair which prevented a complete shutdown in a large mid-Western cement mill, was made on the cast-iron side housing of a

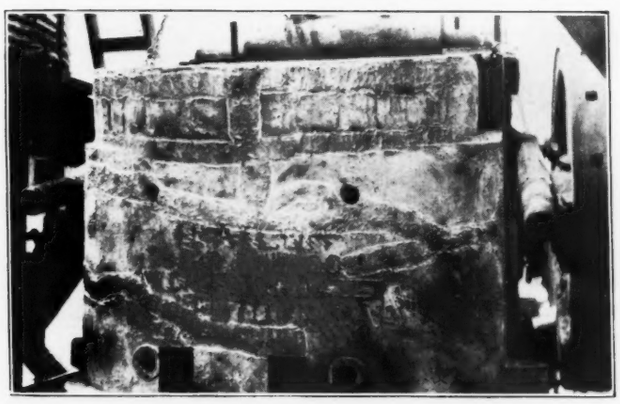


Fig. 3. Large crusher repaired by welding.

limestone crusher. The casting, 2 in. to 4 in. thick, had been cracked in several places, when the tooth of a pinion broke loose and caught between the pinion and gear.

The superintendent, who had previously made important repairs by oxwelding, turned the job over to a contract shop because, since there was about 27 ft. of welding to be done, it was too large for the plant operator alone. Bronze-welding rod was used because only local preheating with the welding blowpipe would be necessary, and because, due to the relatively low melting point of bronze rod, minimum heating would produce welds of utmost strength.

Fig. 4. Cutting a V in casting before welding.

The crack was first V-cut with a blowpipe (Fig. 4) and an air chisel. Two gas-fired torches kept the base metal at the proper temperature during the welding, thus saving oxygen and acetylene. Each V was then tinned with bronze flux and the welding rod applied, building up the crack 2 in. at a time until the end of the V was reached.

The work was completed in 66 hours of actual welding. To have replaced the casting with a new one would have caused a delay of about 20 days. With an output of 1,800 tons a day so curtailed, the replacement cost of the casting would have been the smallest item of loss. To complete the job, a broken tooth was welded back into place (Fig. 6) and the crusher restored to service. Since it has been in operation, the repair has been checked and found entirely satisfactory.

These examples illustrate the value of oxwelding for repair. It is equally useful in fabricating miscellaneous equipment for special purposes.

Production

A firm actively engaged in excavation work keeps its welders busy between repair jobs by having them fabricate welded steel dump-bodies for small trucks. These bodies are made of 12-gauge cold-rolled sheets and 2-in. and 5-in. channel iron. The sheets are cut to pattern and bent to shape after being heated with the welding blowpipe. Each body has only three seams, a total of 50 in. of weld-

Fig. 5. Casting ready for service after welding.

Fig. 6. Building up a damaged gear tooth.

Fig. 7. Chute cut to pattern, formed, and welded by blowpipe.

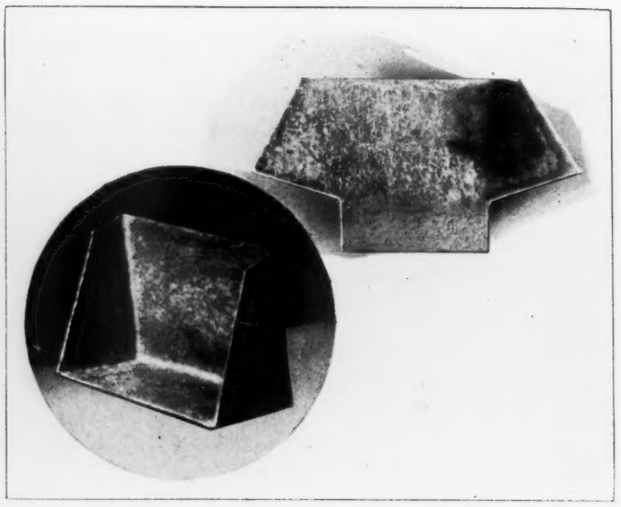


Fig. 8. Clay lifter buckets made by oxwelding.

ing. Welding is also used to join the reinforcing angle irons to the body sheets. Each body requires only two hours of work, exclusive of the time required to prepare the sheets and channels. By oxwelding, this firm makes bodies that are stronger than those fabricated by any other method and at approximately one-half the cost of a ready-made body.

A Southern company needed a special double-barrel smokestack for its dredging equipment. It made one quickly and inexpensively by oxwelding steel plates to form the inner and outer shells. During the welding, the sections were held apart with bolts. The tops of the barrels were joined by welding on a steel-plate ring.

Fig. 7 shows a useful chute that was made in two hours by oxwelding. The 3/16-in. sheet was cut to pattern with a cutting blowpipe, heated with a welding blowpipe preparatory to bending, and welded together. In this instance, oxy-acetylene blowpipes did the work of shears, punch, countersinking drill, bending rolls, forge fire, and riveting hammer.

Fig. 8 illustrates one of the several clay-lifter buckets oxwelded from 3/16-in. steel plate, cut to pattern with an oxy-acetylene blowpipe. These buckets cost only one-half as much as new riveted buckets and are lighter, stronger, and permanently tight. Although they have been given extremely hard usage, none of them has required repair.

Cutting

Mention has been made of the use of the blowpipe for V-cutting. This is only one application. Wherever metal is to be cut, the oxy-acetylene flame provides the quickest means of cutting it. The cutting blowpipe heats the metal to white heat, then plays a jet of pure oxygen on it. The jet eats through the metal like a knife, producing a clean, sharp kerf.

The cutting blowpipe will cut intricate patterns in the heaviest plate. In many cases, parts cut to pattern in this way have successfully replaced expensive castings fractured by accidents.

Another use is in the demolition of obsolete metal structures or machinery. One plant, in scrapping its huge electrical generators, found oxy-acetylene cutting indispensable in reducing large flywheels and field frames to sizes that could be easily handled. Any number of possible applications will suggest themselves to alert plant managers.

In conclusion, the general utility, low initial cost, and labor-saving features of oxy-acetylene equipment recommend its use wherever there is machinery to maintain or repair. Oxy-acetylene installations can be portable or stationary. Any good workman can learn to handle the blowpipe and, with the assistance of oxy-acetylene service operators on extraordinary problems, perform any type of work necessary on pit and quarry equipment.

Prevention of Binding Accidents

(*Continued from page 51*)

which sight is clearly saved through the use of proper protective devices. For each instance in which a goggle lens is shattered or pierced by flying objects there are scores, if not hundreds, of instances in which the goggle lens stops the flight of an object which would have pierced the unprotected eye with disastrous results.

"The comments volunteered by safety engineers and plant managers in this inquiry indicate that there were thousands upon thousands of instances in which tiny fragments of metal or mineral were imbedded in or fused with the goggle lenses and that a high percentage of these instances represents the prevention of blindness or of serious eye injuries.

"Many plants reported they were using non-shatterable lenses. These and, in fact, the lenses of ordinary goggles and masks may be struck dozens of times by large pieces of metal without being pierced or shattered. Any estimate of the number of eyes saved in industry based on the record of goggle lenses broken, shattered or spattered with molten metal or destructive chemicals while in use is, therefore, most conservative."

Run of the inclined conveyor and enclosed conveyor gallery at the plant.

Supplying Aggregates and Concrete for Constructing the Ariel Dam

CONSTRUCTION was started last November on a large dam project on the Lewis River, near Ariel and about twelve miles east of Woodland, Wash. This dam will supply power for the Northwestern Electric Co. of Portland, Ore., who will lease the property from the Inland Power & Light Co. The first installation will be a 40,000-kw. generating unit but with provisions made so that three additional generating units of this same size can be installed later as the demand increases.

The dam itself will be 1,272 ft. from abutment to abutment and will rise to a height of 317 ft. above the foundations. A lake approximately 3,850 acres in area will be formed. A good supply of sand and gravel in the form of a large bar is available immediately below the dam; and it was decided to install a complete sand-and-gravel plant and concrete-mixing plant for utilizing this aggregate. Telsmith engineers were called upon to design this plant and furnish the equipment for the Phoenix Utility Co., which is constructing the dam under contract.

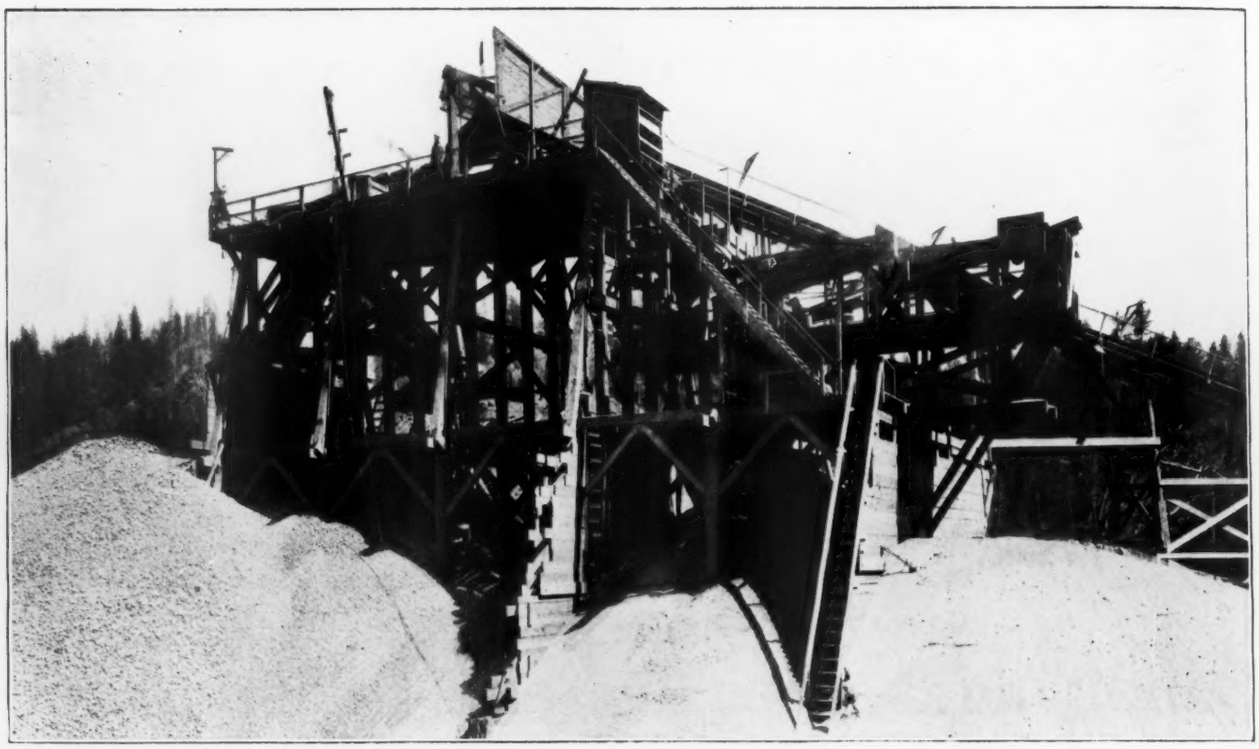
The gravel bar is about 1,200 ft. long and 500 ft. wide and lies along the north bank of the river just below the lower cofferdams. This offers an aggregate supply amply sufficient for the entire project.

Two Sauerman 1,000-ft.-span slackline cableways, equipped with 2-cu. yd. buckets, are used to dig and convey the material from the bar to a bunker on the north bank. These cableways are operated by Sauerman two-speed cableway hoists driven by 150-hp. electric motors. The track cables of the two cableways reach out across the bar and on beyond to two short timber tail towers on the opposite bank of the stream.

The depth of the material in the bar averages about 30 ft. and the buckets clean out the deposit to its full depth. Working a short distance apart, the buckets take one slice after another out of the bar. When one cut is cleaned up, the tail towers are each moved about 40 ft. downstream, always keeping a certain distance apart, and a new cut is started.

The large bunker or receiving hopper is equipped with a Telsmith 30-in. by 5½-in. plate feeder with individual motor drive. This feeds the material to a Telsmith rail grizzly. Oversize from the grizzly goes to a Telsmith No. 10-A breaker equipped with steel frame, steel crown, special steel mainshaft, manganese-steel head and concaves. The product from the crusher with that passing the grizzly goes to a Telsmith 24-in. belt conveyor on 444-ft. centers, which carries it up to a Telsmith 60-in. by 14-ft. washing screen, where the washing water is added. The sand is recovered and dewatered by means of a No. 8 Telsmith sand-settling tank, followed by a Telsmith twin-screw sand rewasher. This combination produces very clean sand, dry enough to carry on a belt conveyor.

A 16-in. by 30-ft. Telsmith roller-bearing belt conveyor is used under the sand rewasher to distribute the sand to two large storage piles. Three finished sizes of washed gravel are also deposited in large storage piles under the screen. A total of 11,000 cu. yd. of finished-material storage is available. A tunnel, equipped with 13 Telsmith Boquad bin gates delivers the material from the storage piles to a Telsmith 24-in. by 455-ft. belt conveyor, which carries it to the top of the central concrete-mixing plant. A Telsmith roller-bearing distributing chute at this point provides an efficient means



Phoenix Utility plant at Ariel dam showing washing screens, sand rewashers, sand tank and storage bins.

of chuting the various sizes of sand and gravel to the different bins over the mixers.

A 14-in. by 290-ft. Telsmith cement conveyor delivers cement to the top of this same bin from a 400-ton-capacity cement bin, located on a hillside adjacent to the plant. Cement is handled in tank trucks to this cement bin from Woodland, Wash., a distance of about 12 miles. Cement screws regulate the flow of cement from the cement bin to the conveyor and from the mixing bin to the concrete mixers.

The central mixing plant has three 2-cu. yd. Smith tilting mixers and was also designed by Telsmith from ideas submitted by Phoenix engineers.

The sand-and-gravel plant has a capacity of 100 cu. yd. per hour and the concrete-mixing plant is capable of producing 1,500 cu. yd. of concrete per day. Forty-two men are employed in two shifts.

A letter from the construction manager of this project states that the plant has worked to the company's satisfaction and, in his opinion, is one of the best that has been used on a job of this kind.

This is the sixth large Telsmith plant used by the Phoenix Utility Co. for large dam projects in the last two years, and one of many being used by large construction companies for dam-building purposes.

Two 2-cu. yd. slackline cableways delivering gravel from river bar to bunker.

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.

Van Dyck Photo

CARL J. LOFSTEDT

Superintendent,
Lone Star Cement Co. Texas
Houston, Tex.

Personal Mention

Lanier Fitzgerald has been placed in charge of the Interlachen, Fla., office of the Interlachen Sand & Gravel Co. Mr. Fitzgerald replaces **L. D. Smith** who was transferred to Jacksonville.

Dr. A. S. McAllister, an electrical engineer with the United States Bureau of Standards since 1921, has been appointed assistant director in charge of commercial standardization.

Prof. Elihu Thomson, head of the Thomson research laboratory of the General Electric Co., Lynn, Mass., on Sept. 27 was tendered a dinner at the New Ocean House, Swampscott, Mass., in recognition of his completion of 50 years of service to the industry. Approximately 700 were present.

Warren Maxwell has been appointed superintendent of the Dodge Works of Link-Belt Co. to replace F. J. Oakes, deceased. Mr. Maxwell joined the Link-Belt Co. in 1922, entering its sales department. In January, 1929, he was made assistant superintendent, from which position he has just been promoted.

Walter Bowman, of Escanaba, Mich., an employee of the Inland Lime & Stone Co. plant at Port Inland, was injured recently when a drill which he was operating broke, causing a wrist fracture.

A. J. Hoskin, editor of PIT AND QUARRY, addressed the Junior members of the Western Society of Engineers, Chicago, at their regular meeting, Monday, September 15, on the mineral wealth of Illinois.

John J. Cone, president Robert W. Hunt Co., Chicago, Ill., who has been identified with that company since its organization in 1888, has retired. **C. B. Nolte,** vice-president and general manager, has been elected president and general manager, with headquarters in Chicago. **J. C. Ogden,** a director and Eastern manager of the company, has been elected vice-president, with headquarters in New York.

H. C. Harrison, research engineer at the Ohio Experimental Station at Roseville, Ohio, has accepted the position of ceramic engineer with the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. **Hobard Kraner,** who held that position, has been promoted.

E. A. Whitney, who has for the past 13 years been connected with the A. P. Green Fire Brick Co., Mexico, Mo., and for the past three years in charge of the specialty department handling high-temperature cements and plastic refractories, has resigned, having accepted a similar position with the Mexico Refractories Co., which has built a new plant in Mexico, Mo., for the production of refractories.

Arthur N. Smith of the Utah Rock Asphalt Co., has announced that the company has discontinued its operations at the quarries near Sunnyside, Utah, for the balance of the season.

Blaine Ottis and **W. E. Anderson** of Sonora, Cal., have started producing sand and gravel from a pit located at Yosemite Junction, Cal.

W. S. Hanford, of San Francisco, has been appointed northern California representative for the Worth Steel Co., Claymont, Del. Mr. Hanford has been identified with the iron and steel trade in California for many years. He was formerly with Jones & Laughlin Steel Corp., and at one time was representative for the Interstate Iron & Steel Co.

Wharton Clay, who has been commissioner since 1920 of the Associated Metal Lath Manufacturers, Chicago, has become identified with the general offices of the Truscon Steel Co., Youngstown, O.

H. Glen Heedy has resigned as assistant to **C. S. Robinson,** vice-president of the Youngstown Sheet & Tube Co. in charge of raw materials, to become associated with Pickands, Mather & Co., Cleveland, O.

George L. Kelley, metallurgist, Budd Mfg. Co., Philadelphia, was the speaker at the regular October meeting of the New Jersey chapter of the American Society for Steel Treating, Oct. 7, at the Berwick Hotel, Newark. His subject was "Automotive Steels."

Charles C. Plummer, formerly Chicago district manager for the R. H. Beaumont Co., Philadelphia, has been appointed manager of the Chicago office of the Bigelow-Liptak Corp., Detroit, manufacturer of suspended furnace walls and arches. **W. D. Dreiske,** of the Chicago office, has been transferred to Detroit.

Bart Kroh, employed in the plant of the Jonesville Gravel Co., Jonesville, Mich., suffered severe bruises to his right leg when he accidentally walked onto a moving conveyor in the plant.

M. M. Austin, research engineer, Fansteel Products Co., Inc., Chicago, addressed the Western Society of Engineers, Chicago, Oct. 2, on "Metals and Alloys for Special Uses."

W. R. Judson, Chilean representative of Allis-Chalmers Mfg. Co., Milwaukee, for 13 years, has been appointed managing director of Allis-Chalmers (France), controlling office for all Europe and northern Africa. Mr. Judson left Oct. 15 for Paris to assume his new duties. He succeeds **H. I. Keen,** who retires after being associated with the company for 25 years, 15 of which were in charge of the Paris office. **Erling Winsnes,** for six years representative in Bolivia, has been appointed to succeed Mr. Judson in Chile.

Clarence B. Randall, formerly of Ishpeming, Mich., has been named president of the Inland Lime & Stone Co., succeeding David Thompson, who died several months ago.

Tom Burton has been named manager of sales for Carney Cement in Chicago and the middle-western zone. Mr. Burton is a pioneer in the field of merchandising masonry cements, with a background of fifteen years of national experience.

Obituary

Walter A. Heath, assistant general superintendent of the Buffington, Ind., plant of the Universal Atlas Cement Co., died October 5, after an illness of two months, at the age of 67. He had been with the Universal Atlas company since 1904, serving successively as shop foreman, construction foreman, mechanical foreman, master mechanic, and assistant general superintendent in charge of mechanical operation. Previously he had been a machinist with the Illinois Steel Co. Funeral services were held, October 8, in Chicago, Ill., in charge of the Englewood Commandery of Knights Templar.

S. H. Wightman, vice president of the Portland Concrete Machines Co., Chicago, died suddenly October 2. He had been operated on for appendicitis, and was believed on the road to recovery. Mr. Wightman was considered an authority on concrete and concrete machinery. Funeral services were held at his home in Hammond, Ind.

James H. Fribley, president of the Community Sand & Gravel Co. of Bourbon, Ind., was fatally injured in an automobile accident on October 2, 1930, while returning home from the company's plant at Plymouth, Ind.

John Leonard Esson, vice-president, Ford, Bacon & Davis, Inc., New York, N. Y., died suddenly at his home in New York last month, aged 52 years. He was a native of Glasgow, Scotland, coming to this country while still a boy. He received his schooling in the Manual Training School in Chicago. After working for several years as an accountant, he entered the field of engineering 23 years ago.

Joseph Teeley, 50, employed in a stone quarry south of Bloomington, Ind., was killed when he was struck by an automobile near his home on Sept. 29.

John B. Hall, president of the York Hill Trap Rock Quarry Co., Meriden, Conn, died September 24.

Coming Events

Nov. 17-19, 1930, Chicago, Ill. Annual meeting, Portland Cement Association, at Blackstone Hotel. Wm. M. Kinney, secretary, 33 W. Grand Ave., Chicago, Ill. (Open to Association members only.)

Dec. 1-5, 1930, Memphis, Tenn. Ninth Annual Asphalt Paving Conference of the Asphalt Institute. Meeting of the Association of Asphalt Paving Technologists in conjunction.

Dec. 1-6, 1930, New York, N. Y. Ninth National Exposition of Power and Mechanical Engineering, to be held at Grand Central Palace. I. E. Moultrop, chairman.

Jan. 12-16, 1931, St. Louis, Mo. Annual convention and show, American Road Builders' Assn. Chas. M. Upham, engineer-director, National Press Bldg., Washington, D. C.

Jan. 19-22, 1931, St. Louis, Mo. Annual Convention National Crushed Stone Assn., Hotel Jefferson. J. R. Boyd, secretary, 1735 14th St., N. W., Washington, D. C.

Jan. 27-29, 1931, St. Louis, Mo. Annual convention National Sand & Gravel Assn., Hotel Jefferson. V. P. Ahearn, executive secretary, Washington, D. C.

Feb. 10-13, 1931, Chicago, Ill. Fifth Midwest Power Engineering Conference. G. E. Pfisterer, secretary, 308 W. Washington St., Chicago.

Feb. 24-27, 1931, Wichita, Kan. Sixth Annual Southwest Road Show and School, Exposition Building. F. G. Wieland, manager, P. O. Box 1043, Wichita, Kan.

April 13-18, 1931. Cleveland, O. National Industrial Equipment Exposition, in connection with Congress on management, maintenance and materials-handling of A. S. M. E. G. E. Pfisterer, managing director, 308 W. Washington St., Chicago, Ill.

July 17-Aug. 28, 1931, Atlantic City, N. J. American Fair, featuring road building, at Auditorium. P. F. Seward, American Road Builders' Assn., Washington, D. C.

Uses Shovels, Clamshell to Dig Compact Material

The Highland Sand & Gravel Co. of Boston, Mass., operates two plants close to the city. One of these is at West Roxbury and the other at Newton.

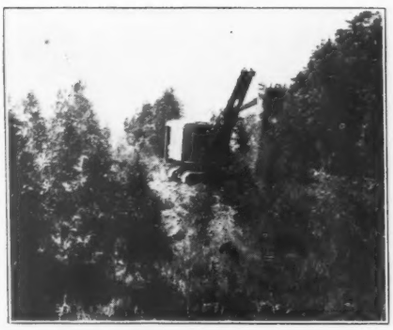
The West Roxbury deposit covers about 40 acres of a high quality gravel. The material is well proportioned from fine to quite coarse pieces and in some spots the deposit is so compact that excavating has been almost impossible. Considerable material also lies under water.

The West Roxbury plant is now making use of two Lorain 75 gasoline shovels with 1¼-cu. yd. buckets and a Lorain 60 1-cu. yd. clamshell crane to excavate the material and with gratifying success.

The crushing and screening plant has a capacity of 2,000 to 2,500 tons daily. Arthur C. West is superintendent as well as treasurer of the concern. George S. Wilbur is president.

Shovel loading to truck.

Clamshell working on stock-piles at the Highland plant.



Shovel stripping deposit.

Truck Salvaged

The motor truck shown in the above picture, owned by Ruck Bros., a sand and gravel firm, has just been pulled out of a water-filled quarry. The driver backed a load of refuse too close to the edge and the truck slid into the water to be taken out some hours later by the cranes, apparently unharmed.

The truck body and hoist pistons were manufactured by the Heil Co., Milwaukee, Wis., and the picture graphically portrays the effectiveness of the hoist pistons, which in this unusual case are bearing the full weight of the body.

Branch Office and New Warehouse in New York

The Owen Bucket Co. of Cleveland, O., announces the opening of a new branch office and warehouse in New York, located at 36 25 Twenty-second Street, Long Island City. This new office is in charge of Frank W. S. Elmes, well-known in the material handling and construction fields throughout the East. The announcement follows the recently established branch offices in Chicago and Oakland, Cal.

Financial News

The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of PIT AND QUARRY, *for which no responsibility in any way is to attach to this magazine or to any of its staff.*

Lehigh Portland Common Is Placed on $1 Basis

Lehigh Portland Cement Co. has declared a quarterly dividend of 25 cents on the common stock payable November 1 to stock of record October 14. This places the stock on a $1 annual basis as against $2.50 previously paid.

However, the company's plant at Fordwick, near Staunton, Va., resumed full-time operations October 1, after more than a year on half-time schedule.

At present, the 150,000-barrel silo stockhouse is practically empty, and orders are almost normal. Workmen are engaged in installing new separating machinery.

Group of Bondholders Forms Protective Body

A protective committee has been formed for the first and refunding bonds of Asbestos Corp., Ltd., as follows: A. B. Brodie, Price Waterhouse and Co., A. B. Colville, Sun Life Assurance Co. of Canada, A. P. S. Glassco, McGill University, Col. E. G. Hanson, Hanson Bros., Inc., R. W. Steele, Dominion Securities Corp., Ltd. The committee has been formed to protect the interests of the bondholders should reorganization of the company become necessary. Holders of about $700,000 of the bonds have already signified their intention of depositing their bonds with the committee.

Freeport-Texas Reports Gain in Sulphur Sales

Freeport Texas Co. declared the regular quarterly dividend of $1, payable November 1 to stock of record October 15.

Domestic sales of sulphur by Freeport Texas for the first nine months of this fiscal year have exceeded those for the corresponding period of 1929, which was the best year in the company's history.

"At this time of reduced industrial activity in this country," Eugene L. Norton, president, said, "the management is gratified that our domestic sales this year have not declined with general business, but have maintained at a level actually greater than that prevailing in 1929. This is due to constantly increasing industrial use of sulphur and the fact that our markets are so diversified."

International Cement's Third-Quarter Net Up

International Cement Corp. reports, for the quarter ended Sept. 30, 1930, net income of $1,395,003 after depreciation, and federal taxes; equivalent to $2.20 per share on 633,452 no-par shares of common stock. This compares with $1,210,282 or $1.91 per share on 631,356 shares in the preceding quarter and $1,360,356 or $2.20 per share on 619,049 shares in the third quarter of the previous year.

The net income for the first nine months of 1930 was $3,446,766 after above charges, equal to $5.44 per share on 633,452 shares, comparing with $3,527,764 or $5.70 per share on 619,049 shares in the first nine months of 1929.

The company had a good September, the net profit, after charges and taxes, representing an increase of 33 per cent over the corresponding month of last year. Earnings last month totaled about $444,090, equivalent to around 70 cents per share on the outstanding 633,452 shares of common stock, as compared with $336,000 or 54 cents per share on 619,049 shares in Sept., 1929.

The increased earnings last month and for the third quarter are attributable mainly to additional economies in operation at the various plants. Another contributing factor has been the sharp expansion in demand for the company's high-early-strength cement which is marketed under the trade-name of Incor and commands a somewhat higher price than ordinary portland cement.

Net profits for the entire year 1930 are estimated, by interests close to the company, at about $7.50 per share. This would compare with a net of $4,950,433 or $7.88 per share on 627,865 shares in 1929. The peak of International Cement's earnings occurred in 1928 when the profit totaled $5,149,388 or $7.90 per common share on 618,826 shares after preferred dividends.

The company continues to improve its already good cash position. After the payment of the Sept. 30, 1930, dividend disbursement, cash was in excess of $3,500,000, comparing with $1,900,000 on Jan. 1, 1930.

Liberal charges to depreciation continue to be made. For the first nine months of the current year, $2,160,579 was so charged out, as against $1,932,654 in the comparable period of 1929.

Leslie-California Salt Shows Drop in Earnings

The report of Leslie-California Salt Co. and subsidiaries, for the year ended June 30, 1930, shows a net profit of $163,949 after depreciation, federal taxes, etc., equivalent to $1.40 per share on 116,650 shares of no-par capital stock. This compares with $279,522 or $2.40 a share in the preceding year.

Pennsylvania-Dixie Co. Reports for 12 Months

Consolidated net profit of Pennsylvania-Dixie Cement Corp. and subsidiaries for twelve months ended Sept. 30, 1930, amounted to $417,192 after depreciation, depletion, interest and federal taxes, comparing with $686,072 for the twelve months ended Sept. 30, 1929.

CURRENT DIVIDENDS

Company	Class of Stock	Dividend Rate	Holders of Record	Payable	Company	Class of Stock	Dividend Rate	Holders of Record	Payable
Alpha Portland Cement	Common	$0.50 qr.	Oct. 1	Oct. 25	Kentucky Rock Asphalt	Common	$0.40 qr.	Sept. 15	Oct. 1
American Aggregates Corp.	Preferred	1¾% qr.	Sept. 20	Oct. 1	Lehigh Portland Cement	Common	$0.25 qr.	Oct. 14	Nov. 1
Boston Sand and Gravel	Preferred	$0.87½ qr.	Sept. 22	Oct. 1	Limestone Products	7% Pfd.	1¾% qr.	Sept. 15	Oct. 1
Boston Sand and Gravel	Common	$0.40 qr.	Sept. 22	Oct. 1	Medusa Portland Cement	Preferred	1½% qr.	Sept. 25	Oct. 1
Calaveras Cement Co	7% Pfd.	1¾% qr.	Sept. 30	Oct. 15	Medusa Portland Cement	Common	$1.50 qr.	Sept. 25	Oct. 1
Canada Gypsum and Alabastine	Common	$0.37½ qr.	Sept. 14	Oct. 1	Metropolitan Paving Brick	Preferred	$1.75 qr.	Sept. 15	Oct. 1
Cleveland Builders Supply	Common	$0.50 qr.	Sept. 15	Oct. 1	Mineral Products Co	Pfd. "A"	$0.20 qr.	Sept. 30	Oct. 1
Consolidated Oka Sand and Gravel	Preferred	1¾% qr.	Sept. 27	Oct. 1	New York Trap Rock	Preferred	$1.75 qr.	Sept. 20	Oct. 1
Consumers Co	Pr. Pfd.	$1.50 qr.	Sept. 15	Oct. 1	Peerless Cement	Preferred	$1.75 qr.	Sept. 20	Oct. 1
Coronet Phosphate Co		$2.00 qr.	Sept. 14	Oct. 1	Pennsylvania Salt	Common	$1.25 qr.	Sept. 30	Oct. 15
Dolese and Shepard		$2.00 qr.	Sept. 20	Oct. 1	Santa Cruz Portland Cement		$1.00 qr.	Sept. 24	Oct. 1
Dufferin Pav. and Crushed Stone	7% Pfd.	1¾% qr.	Sept. 17	Oct. 1	Sterling Salt	Common	$0.50 qr.	Sept. 24	Oct. 1
Ideal Cement Co	Common	$1.75 qr.	Sept. 13	Oct. 1	Superior Portland Cement	Class A	$0.27½ M	Oct. 18	Nov. 1
Illinois Brick		$0.60 qr.	Oct. 1	Oct. 15	Warner Co	1st Pfd.	$1.75 qr.	Sept. 15	Oct. 1
International Salt	Common	$0.75 qr.	Sept. 15	Oct. 1	Warner Co	2nd Pfd.	$1.75 qr.	Sept. 15	Oct. 1
Johns Manville	Preferred	$1.75 qr.	Sept. 11	Oct. 1	Warner Co	Common	$0.50 qr.	Sept. 30	Oct. 15
Johns Manville	Common	$0.75 qr.	Sept. 25	Oct. 15	Warner Co	Common	$0.25 extra	Sept. 30	Oct. 15
					Worcester Salt Co	Common	1¼% qr.	Sept. 24	Oct. 1
					Newago Portland Cement	7% Pfd.	$1.75 qr.	Sept. 25	Oct. 1

Latest Portland-Cement Statistics

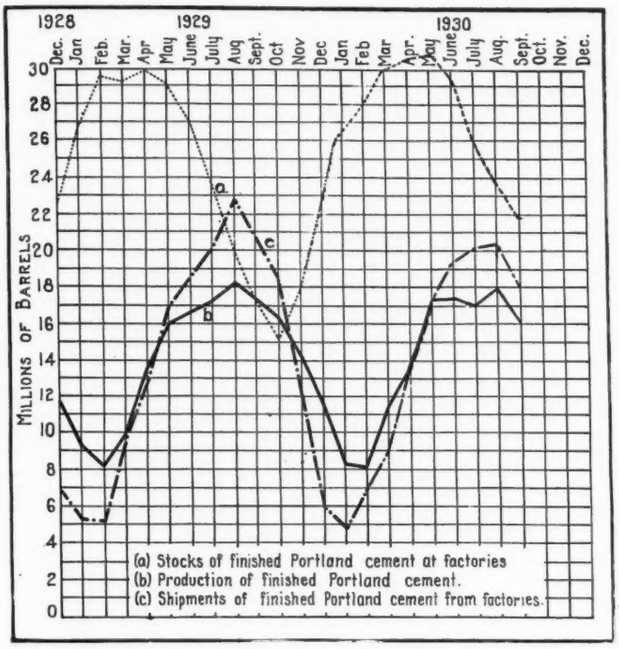

1928
1929
1930
Dec. Jan Feb. Mar. Apr May June July Aug Sept. Oct Nov Dec Jan Feb Mar Apr. May June July Aug. Sept. Oct. Nov. Dec.
MILLIONS OF BARRELS
30 28 26 24 22 20 18 16 14 12 10 8 6 4 2 0
a
b
c
(a) Stocks of finished Portland cement at factories
(b) Production of finished Portland cement.
(c) Shipments of finished Portland cement from factories.

Chart showing production, shipments, and stocks on hand of finished Portland cement, by months—December, 1928, to September, 1930.

The Portland-cement industry in September, 1930, produced 16,124,000 bbl., shipped 18,083,000 bbl. from the mills, and had in stock at the end of the month 21,864,000 bbl., according to the United States Bureau of Mines, Department of Commerce. Production in September showed a decrease of 6.4 per cent and shipments a decrease of 9.4 per cent, as compared with September, 1929. Portland cement stocks at the mills were 26.2 per cent higher than a year ago. The total production for the nine months ending September 30, 1930, amounts to 126,917,000 bbl., compared with 128,199,000 bbl. in the same period of 1929, and the total shipments for the nine months ending September 30, 1930, amounts to 128,673,000 bbl., compared with 133,569,000 bbl. in the same period of 1929.

In the statement of relation of production to capacity, the total output of finished cement is compared with the estimated capacity of 166 plants both at the close of September, 1930, and of September, 1929. In addition to the capacity of the new plants which began operating during the twelve months ended September 30, 1930, the estimates include increased capacity due to extensions and improvements at old plants during the period.

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN AUGUST, 1930

Exported to—	Barrels	Value
Canada	8,208	$24,521
Central America	2 194	7,321
Cuba	6,297	15,444
Other West Indies and Bermuda	3,968	7,729
Mexico	12,709	37,360
South America	11,390	51,788
Other Countries	4,265	23,416
	49,031	$167,579

DISTRIBUTION OF CEMENT

Shipped to—	July		August	
	1929	1930	1929	1930
Alabama	227,381	137,184	271,466	106,464
Alaska	2,307	1,774	2,105	4,465
Arizona	46,241	34,382	57,184	51,855
Arkansas	181,615	184,225	187,688	165,886
California	905,437	846,508	1,007,181	869,963
Colorado	107,528	92,898	105,397	106,576
Connecticut	213,551	191,178	241,126	205,553
Delaware	43,016	68,752	56,135	47,898
District of Columbia	118,426	87,492	125,732	126,581
Florida	99,338	105,993	100,975	85,673
Georgia	157,113	147,652	160,279	186,694
Hawaii	21,348	18,164	26,037	19,301
Idaho	33,383	51,059	26,051	52,084
Illinois	1,835,790	1,495,891	1,969,576	1,604,378
Indiana	745,533	864,425	990,059	686,122
Iowa	809,784	1,184,588	1,108,711	1,077,919
Kansas	225,611	226,827	338,052	271,491
Kentucky	187,060	223,147	205,597	265,288
Louisiana	117,311	308,306	172,697	235,564
Maine	73,594	95,005	79,258	128,866
Maryland	305,219	274,298	323 021	314,239
Massachusetts	335,635	324,874	365,297	328,187
Michigan	1,677,282	1,253,055	1,891,753	1,269,546
Minnesota	478,941	647,064	533,434	602,931
Mississippi	109,161	66,721	131,963	96,483
Missouri	725,967	737,463	896,327	770,346
Montana	67,366	37,429	89,417	36,407
Nebraska	150,214	210,545	270,919	226,618
Nevada	10,841	15,694	12,186	14,645
New Hampshire	98,708	80,647	116,275	81,651
New Jersey	877,662	788,857	958,357	709,844
New Mexico	25,281	31,722	29,932	36,680
New York	2,596,425	2,474,955	2,768,232	2,596,407
North Carolina	171,148	108,620	149,085	116,028
North Dakota	69,425	53,178	47,870	31,984
Ohio	1,236,231	1,294,504	1,364,665	1,286,700
Oklahoma	323,528	362,973	371,205	360,766
Oregon	101,161	116,047	124,852	114,400
Pennsylvania	1,565,726	1,915,236	1,710,648	1,912,983
Porto Rico	7,702	8,250	6,995	4,500
Rhode Island	73,134	66,903	101,278	83,057
South Carolina	140,609	185,517	89,733	236,649
South Dakota	61,786	82,598	55,114	72,829
Tennessee	405,704	267,623	441,869	285,916
Texas	771,695	644,850	877,463	605,660
Utah	43,737	38,485	57,547	44,554
Vermont	145,097	112,145	181,612	104,324
Virginia	194,236	182,631	205,771	179,227
Washington	263,893	330,911	310,711	341,647
West Virginia	194,649	199,923	209,590	216,018
Wisconsin	823,678	810,875	952,914	842,250
Wyoming	21,230	23,380	26,480	20,642
Unspecified	40,750	0	89,633	20,373
	20,265,188	20,113,423	22,993,454	20,263,112
Foreign countries	53,812	39,577	58,546	35,888
Total shipped from cement plants	20,319,000	20,153,000	23,052,000	20,299,000

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN AUGUST, 1930

Imported from—	District into which imported	Barrels	Value
Canada	Maine and New Hampshire	588	$ 1,554
	Vermont	7	18
	Total	595	$ 1 572
Denmark	Porto Rico	11,560	13,512
Japan	Hawaii	783	832
United Kingdom	New York	1,010	1,247
	Philadelphia	21 375	21,866
	Total	22,385	$23,113
	Grand Total	35,323	$39,029

RELATION OF PRODUCTION TO CAPACITY

	September		August	July	June
	1929 (*per cent*)	1930 (*per cent*)	1930 (*per cent*)	1930 (*per cent*)	1930 (*per cent*)
The month	81.8	75.7	81.0	77.8	81.4
The 12 months ended	67.5	65.2	65.6	66.1	66.4

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1929 AND 1930 (*In thousands of barrels*)

Month	Production		Shipments		Stocks at End of Month	
	1929	1930	1929	1930	1929	1930
January	9,881	8,498	5,707	4,955	26,797	27,081
February	8,522	8,162	5,448	7,012	29,870	28,249
March	9,969	11,225	10,113	8,826	29,724	30,648
April	13,750	13,521	13,325	13,340	30,151	30,867
May	16,151	17,249	16,706	17,224	29,624	30,891
June	16,803	17,239	18,949	18,781	27,505	29,364
July	17,315	17,078	20,319	20,153	24,525	26,289
August	18,585	17,821	23,052	20,299	20,056	23,824
September	17,223	16,124	19,950	18,083	17,325	21,864
October	16,731	.....	18,695	.....	15,381	.....
November	14,053	.....	11,222	.....	18,213	.....
December	11,215	.....	5,951	.....	23,550	.....
	170,198	.....	169,437	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER, BY MONTHS, IN 1929 AND 1930 (*In thousands of barrels*)

Month	Production		Stocks at End of Month		Month	Production		Stocks at End of Month	
	1929	1930	1929	1930		1929	1930	1929	1930
January	12,012	10,504	9,642	9,646	July	15,214	15,067	11,619	11,682
February	11,255	10,008	12,436	11,572	August	15,829	15,237	8,995	9,266
March	12,450	13,045	14,948	13,503	September	15,165	14,587	7,009	7,852
April	14,166	15,025	15,479	15,164	October	15,515	.....	5,934	.....
May	15,444	16,607	14,911	14,668	November	14,087	.....	6,134	.....
June	15,312	15,895	13,587	13,452	December	12,539	.....	7,526	.....

PRODUCTION AND STOCKS OF CLINKER, BY DISTRICTS, IN SEPTEMBER, 1929 AND 1930 (*In thousands of barrels*)

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN SEPTEMBER, 1929 AND 1930, AND STOCKS IN AUGUST, 1930 (*In thousands of barrels*)

District	Production		Stocks at End of Month		September						Stocks at End of August
					Production		Shipments		Stocks at End of Month		
	1929	1930	1929	1930	1929	1930	1929	1930	1929	1930	1930
Eastern Pa., N. J., and Md	3,250	2,919	1,297	1,300	3,600	3,273	3,924	3,813	4,452	4 969	5,509
New York and Maine	1,023	1,180	507	454	1,241	1,238	1,434	1,467	1,274	1,069	1,298
Ohio, Western Pa., and W. Va	1,624	1,622	607	748	1,919	1,873	2,386	1,984	2,685	3,079	3,190
Michigan	1,239	1,006	538	800	1,519	1,242	1,800	1,381	961	2,279	2,418
Wis., Ill., Ind., and Ky	1,731	1,665	512	878	2,182	2,171	2,759	2,716	1,740	2,751	3,295
Va., Tenn., Ala., Ga., Fla., and La	1,157	1,197	686	925	1,298	1,198	1,311	1,178	1,610	1,813	1,794
Eastern Mo., Ia., Minn., and S. Dak	1,551	1,627	562	499	1,670	1,748	2,325	2,116	1,426	1,569	1,937
W. Mo., Nebr., Kans., Okla., and Ark	1,276	1,204	250	258	1,422	1,233	1,542	1,227	798	1,643	1,637
Texas	712	653	268	279	707	679	681	599	492	707	627
Colo., Mont., Utah, Wyo., and Idaho	263	291	314	302	314	260	358	258	475	511	509
California	1,020	861	1,060	1,016	967	806	1,023	905	941	1,005	1,105
Ore. and Wash	319	362	408	393	384	403	407	439	471	469	505
Totals	15,165	14,587	7,009	7,852	17,223	16,124	19,950	18,083	17,325	21,864	23,824

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1929 AND 1930

Month	Exports				Imports			
	1929		1930		1929		1930	
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	78,639	$283,002	82,387	$293,135	151,302	$177,976	201,609	$207,461
February	58,886	225,590	64,267	217,798	118,930	123,123	114,455	119,717
March	69,079	235,164	117,563	357,896	131,909	112,788	43,622	59,981
April	64,145	218,316	57,419	200,217	89,668	114,281	140,871	178,226
May	57,955	219,366	57,423	198,170	200,646	267,854	94,696	111,998
June	96,055	287,612	82,077	223,639	203,545	228,170	55,356	74,370
July	71,992	247,177	47,082	166,577	182,098	199,960	12,404	20,973
August	60,013	225,762	49,031	167,579	183,938	199,403	35,323	39 029
September	86,268	308,631	.....	.....	112,372	152,239	.....	.....
October	101,359	337,839	.....	.....	172,566	187,504	.....	.....
November	53,378	198,197	.....	.....	96,568	95,844	.....	.....
December	88,403	297,255	.....	.....	84,358	79,098	.....	.....
Totals	886,172	$3,083,911	.....	.....	1,727,900	$1,938,240	.....	.....

Trucks Speed Delivery from Quarry to Roadbed

By no means the least of the attractions offered tourists in Massachusetts, as well as other Eastern states, is a wonderful network of hard-surfaced highways, which appeal particularly to that large number who travel by automobile. Mile after mile these wonderful roads wind around imposing hills, through beautiful valleys, piercing picturesque wooded sections and stretching off into the distance on long straightaways.

Obviously these splendid travel facilities could only result from extensive and consistent road-building activities and, as in other parts of the country, motor trucks have proved a potent factor in expediting this work. An important service is rendered by five Federals owned by the M. McDonough Co., of Malden, Mass., in highway construction. These were all purchased as used trucks and perform the work of hauling boulders from the quarry ledge to crusher. These trucks carry heavy loads, transporting from 1,200 to 1,400 tons per day. They feed enough rock to the crusher to keep 30 trucks busy hauling it away.

The McDonough Company has built special bodies for these trucks of heavy timber to stand the tremendous strain of this work.

Traffic News and Comment

Soapstone and Talc

The Southern carriers have been asked to revise the present rates on soapstone and talc from various producing points in the Carolinas and the Southeast to the Ohio River and points north thereof.

The points of production involved are from the Marshall, N. C., Murphy, N. C., Chatsworth, Ga., Cartersville, Canton, Jasper, Ga., and Kinsey, N. C., groups.

The proposed rates from Marshall Group are made on basis of rates generally the same as at present in effect from Schuyler, Va., when the distance from Marshall Group is less or approximately the same, with rates to other points made in relation thereto.

From Chatsworth, Ga., the suggested rates are made no higher than suggested from Marshall Group.

From Murphy, N. C., the suggested rates are the present differential of 45 cents per net ton over the Marshall Group rates.

From Cartersville, Canton, Jasper, Ga., and Kinsey, N. C., the proposed rates are the present differential of 81 cents per net ton over the Chatsworth, Ga., rates.

The proposed rates per net ton from Marshall Group to representative destinations are:

To—	Proposed rate
Akron, O.	$4.10
Barberton, O.	4.10
Bay City, Mich.	4.15
Brazil, Ind.	3.96
Cheboygan, Mich.	5.52
Cincinnati, O. (proper)	3 32
Cincinnati, O. (for beyond)	2.39
Chicago, Ill.	4.68
Columbus, O.	4.10
Detroit, Mich.	4.10
Grand Rapids, Mich.	4.35
Indianapolis, Ind.	3.96
Kalamazoo, Mich.	4.15
Middletown, O.	3.49
Milwaukee, Wis.	4.74
Saginaw, Mich.	4.15
St. Louis, Mo.	4 91
Toledo, O.	4.10
Youngstown, O.	4.10

Coated Crushed Stone

A shipper of coated crushed stone, located at Tyrone Forge, Pa., has asked the eastern railroads to establish additional commodity rates as follows:

To—	Rate
Pancoast, Pa.	$1.85
Brookville, Pa.	1.85
East Brady, Pa.	1.70
Sligo, Pa.	1.85
Mayport, Pa.	1.85
Summerville, Pa.	1.95
Johnsonburg, Pa.	1.85
Ridgway, Pa.	1.70
Blue Rock, Pa.	1.85

This subject is covered by Trunk Line Association Docket 24,721, and it is contended the rates sought are in line with the rates to Pittsburgh, Pa., and to Grafton and Clarksburg, W. Va., now in effect, competing points.

* * *

Coated Crushed Stone from West Columbus, Ohio

A shipper of coated crushed stone has asked the Central Freight Association Lines to establish a line of commodity rates on his products to various destinations in the States of Indiana, Illinois, Michigan, Pennsylvania and West Virginia. The matter is covered by Central Freight Association Docket No. 26,313.

The following are representative of the present rates and the rates sought:

From West Columbus, Ohio

To—	Present rate in cents per 100 lb.	Proposed rate in cents per ton
Adrian, Mich.	18½	$1.88
Alida, Ind.	22	2.34
Belle Vernon, Pa.	20½	1.99
Bloomfield, Ind.	22	2.34
Buffalo, N. Y.	23½	2.68
Charleston, W. Va.	19½	1.99
Chester, W. Va.	20½	1.99
Columbus, Ind.	20½	1.99
Danville, Ill.	22	2 34
Detroit, Mich.	20	1.99
Evansville, Ind.	24½	2.80
Ft. Wayne, Ind.	18½	1.88
Goshen, Ind.	21½	2.22
Green Castle, Ind.	21	2.11
Hartford City, Ind.	17	1.76
Hillsdale, Mich.	20	1.99
Huntington, W. Va.	18	1.76
Johnstown, Pa.	23½	2.59
Kenova, W. Va.	17	1.76
Kokomo, Ind.	20½	1.79
Lebanon, Ind.	20½	1.99
Logansport, Ind.	20½	1.99
Meadville, Pa.	21½	2 22
Monticello, Ind.	21	2 11
Muncie, Ind.	17	1.76
Noblesville, Ind.	19½	1 99
Oil City, Pa.	22	2.34
Princeton, Ind.	24	2 68
Richmond, Ind.	16½	1.53
Sharon, Pa.	20	1.99
Shenango, Pa.	20	1 99
Sturgis, Mich.	20½	2 11
Trenton, Mich.	18½	1 88
Walkerton, Ind.	21½	2.22

Agricultural Limestone

Central Freight Association Docket 26,272 relates to an application made by a shipper of agricultural limestone, crushed stone and stone screenings located at Delphos, Ohio, seeking a revision of present rates to various destinations in Indiana.

The present and proposed rates are shown below:

To—	Present rate	Proposed rate
Monroeville, Ind.	$0.75	$0.70
Hadley, Ind.	0.88	0.85
Arcola, Ind.	0.88	0.85
Warsaw, Ind.	1.05	1.00
Atwood, Ind.	1.16	1.10
Etna Green, Ind.	1.22	1.15
Bourbon, Ind.	1.27	1.15
Inwood, Ind.	1.32	1.15
Plymouth, Ind.	1.32	1.25

Sand and Gravel

The railroads have been asked to reduce the present rates on sand and gravel from Seymour and Terre Haute, Ind., to various destinations in Indiana.

Among the rates sought by the shipper in Central Freight Association Docket 26,384 are the following:

From Seymour

To—	Present rate	Proposed rate
Oolitic, Ind.	$0.88	$0.75
Zelma, Ind.	0.85	0.65
Norman, Ind.	0.85	0.65
Surprise, Ind.	0.70	0.60
Cortland, Ind.	0.69	0.60
Elizabethtown, Ind.	1.00	0.60
Alert, Ind.	1.00	0.65
Westport, Ind.	1.01	0.65

From Terre Haute

To—	Present rate	Proposed rate
Oolitic, Ind.	$1.01	$0.95
Zelma, Ind.	1.13	1.00
Norman, Ind.	1.13	1.00
Surprise, Ind.	1.13	1.05
Cortland, Ind.	1.13	1.10
Elizabethtown, Ind.	1.26	1.15
Alert, Ind.	1.30	1.15
Westport, Ind.	1.35	1.20

* * *

The Eastern Trunk Lines railroads have been asked to reduce rates on sand and gravel from Sherburne, N. Y., to several destinations within the State of New York.

It is contended that the rates sought are in line with the existing rate from Four Corners, N. Y.

The shipper asks to have his rate to Woodbridge, N. Y., Luzon, N. Y., and Fallsburgh, N. Y., made $1.50; to Hancock, N. Y., $1.20; Delhi, N. Y., $1.25; Liberty, N. Y., and Ferndale, N. Y., $1.40.

Gypsum

Specifically mentioning Council Bluffs, Sioux Falls, S. D., four North Dakota cities and Joplin, Mo., the gypsum industry has laid the foundation for a review of all freight rates on gypsum and gypsum products to points in the middlewest and far west, according to a special dispatch from Washington, D. C.

A complaint was filed with the interstate commerce commission that the needs of the gypsum shippers in the west are such that gypsum products must be shipped in mixed carloads, which, according to the rule of the railroads named as defendants, must take the high rate accorded to plaster wall board.

Signing the complaint are the following gypsum producers: American Gypsum Co., Atlantic Gypsum Co., Best Brothers Keene's Cement Co, Certain-teed Products Co., Ebsary Gypsum Co., Inc., Federal Gypsum Co., Grand Rapids Plaster Co., National Gypsum Co., Oakfield Gypsum Corp., Texas Cement Plaster Co., United States Gypsum Co., and Abel Davis and Eugene Holland, receivers for the Universal Gypsum & Lime Co.

Reparation for overcharges in the past for shipments to several hundred western communities is demanded, as well as an investigation into the present rates by the commission.

Review of Foreign Practice

Cable Transport System in Quarry on Riviera

The construction of a transportation system for a quarry on the Riviera presented several difficulties in the form of utilizing an existing system of tracks and cars, serving to transport paving stone and broken rock from the quarry to railroad cars and to the crushing plant, and overcoming such handicaps in the terrain as steep inclines and curves. The Heckel company of Saarbruecken laid out for this quarry an interesting cable-haulage installation that meets

Clamp for attaching chain to cable.

all the requirements. It is a two-track system extending through the quarry in a wide-spread network of tracks to various parts of the quarry face, and quarry cars are hauled in from the quarry by an endless and continually operating cable which moves toward the quarry above one track and back over the other. Special clamps are used to attach the cars to the cable by means of chain connections, and practically any type of car can be handled.

The installation is planned for a capacity of 500 cars in nine hours, figuring empty cars at 500 to 700 kilograms and the loads at 1,500-1,700 kilograms. The cable moves at a speed of 120 ft. per min., and the capacity is figured on an assumption of an interval of 130 ft. between cars. The total length of the principal line is 3,666 ft. and the maximum difference in elevation is 115 ft. This line is driven by a 30-hp. motor. Another line 750 ft. long reaches to another quarry and has a separate drive.—Dr. E. Schiefer in *Steinindustrie* 25:238, July 10, 1930.

Study Composition of Blast-Furnace Cement

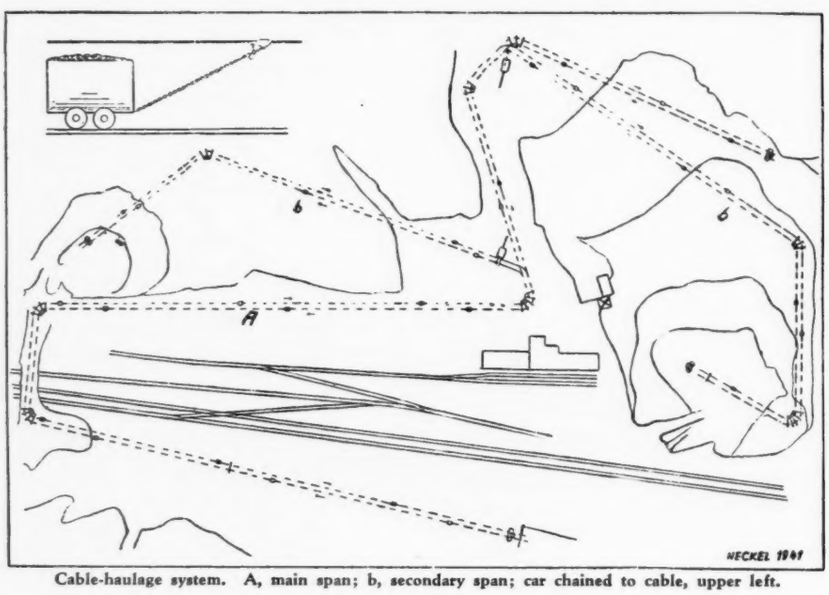
There are two varieties of cement on the market that are composed of portland cement clinker added to blast furnace slag, the first ("iron Portland cement") containing a minimum of 70 per cent of clinker, the second ("blast-furnace cement" or "slag Portland cement") containing a smaller proportion of clinker; both are to be distinguished from slag cements made up of hydrated lime and slag without the addition of clinker. The laboratory studies reported in this article concern only the second class, and investigations were made both to determine the best or "ideal" proportion of slag to clinker and to determine the strength values in comparison with regular Portland cement. Theoretical chemical calculations show the optimum composition of blast furnace cement as 34.7 per cent of clinker and 65.3 per cent of slag, and the laboratory tests yielded most favorable strength values for the cement with this proportion—in 1:3 mixes, tensile strengths of 23.2 kg./cm² at 7 days, 36.9 at 28 days, 43 at three months and 39.6 at one year, and compression strengths of 158 kg./cm² at 7 days, 257 at 28 days, 416 at three months, and 466 at one year. Tests in comparison with Portland cement show that in the first days of hardening the strength is very low in comparison with Portland but at three months its mechanical properties approach the latter and at the end of a year reach almost the same values.

Some of the conclusions drawn from this study are:

(1). Blast-furnace cement is able to reach a very high ultimate strength but is characterized by slow hardening.

(2). It is therefore evident that blast-furnace cement is not suited to certain works as in the construction of beams, where it is necessary to use a cement of more rapid hardening permitting the removal of beams quickly and without risk.

(3). Projects requiring large quantities of cement can make a considerable saving through the use of this material, as the cost is about half that of standard Portland, due to the low cost of the slag that forms about 70 per cent of the product.—A. O Purdon in *Revue des Materiaux de Construction* No. 249:205-212, June, 1930.



Cable-haulage system. A, main span; b, secondary span; car chained to cable, upper left.

Impose New Handicap on World Cement Standards

The Spanish standard specifications for cement that have held since May 27, 1919, are considerably changed by a royal order of Feb. 25, 1930. All strength values have been increased; on the other hand, permissible magnesia content has been increased from 3 to 5 per cent, the permissible total sulphur from 1 to 1.25 per cent, these two points being an alleviation of former requirements. Completely new specifications are given for high-strength "super-cements" and alumina cement, also blast-furnace cement, puzzolan cement and Zumaya natural, or Roman, cement. Concerning the Zumaya cement, it is striking that coal ash is reckoned as puzzolana and exact figures are given for the amount and quality of fuel; the raw material for this cement is a marl of 59.8 to 66 per cent of calcium carbonate, thus it is not to be confused with the usual natural cements known elsewhere, which as is known have calcium carbonate contents of some 80 per cent.

In all the new Spanish standards present a serious handicap to the negotiations under way for international standardization of cement specifications, since they show not only notable variations from the standards of other countries, but also a great disparity between the different cements covered by their own specifications.—*Tonindustrie-Zeitung* 54:1023-24, Aug. 4, 1930.

Recent Patents

AMERICAN

Crushing

Crushing-mill. Henry E. Whipple, Los Angeles, Cal. No. 1,777,061.

Handling Material

Excavating, loading, and dumping device. Harry K. Clemons, St. Paul, Minn. No. 1,777,164.

Socket tooth for excavating-buckets. Edward E. Pierce, Sacramento, Cal. No. 1,777,222.

Mining

Apparatus for mining. Theodore K. Vogeley, Butler, Pa. No. 1,776,799.

Mining apparatus. Edwin E. Claytor, New York, N. Y. No. 1,776,889.

FOREIGN

Cement and Concrete

Preparation for waterproofing cement used in buildings, and process connected therewith. A. Stewart. British 334,053.

Process for the production of improved Portland cement. International Cement Corporation. German. 506,615.

Reinforced concrete. H. D. Elkington (Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij). British 333,940.

Crushing and Grinding

Grinding and subdividing apparatus. J. E. Gernelle-Danloy. British 311,329.

Grinding mills. Babcock & Wilcox, Ltd. British 334,058.

Regulating device for roller mills. Oscar Soder. German 506,902.

Ring-roller mill. Adolph Steinbrueckner. German 506,903.

Drilling

Method of heat-treating boring or drilling tubes and rods. Mannesmannroechren-Werke. British 308,346.

Percussive tools. G. H. T. Rayner and P. T. Rayner. British 334,108.

Drilling device. The Universal Rotary Bit Co. (Arthur M. Gildersleeve and Charles L. Dean.) Canadian 303,891.

Dryers

Drying kiln. B. F. Sturtevant Co. Canadian 304,062.

Firing

Distributor for pulverulent fuel burners. Allgemeine Electrizitaets-Gesellschaft. Canadian 303,835.

Gypsum

Method of making plaster tiles from calcined gypsum. Fire Proof Wall Co. Canadian 304,018.

Kilns

Closing device for rotating trommels. Friedr. Krupp Grusonwerk Akt.-Ges. German 506,710.

Material-handling

Conveyors. H. V. Nielson and Multifillers, Ltd. British 334,225.

Elevator conveyors of the belt type. Mavor & Coulson Ltd. and F. W. Warren. British 334,441.

Trough conveyors. L. Boileau. British 334,487.

Conveyors. Rock Springs Loader Co. British 334,490.

Conveyors. Fuller Company. British 317,403.

Apparatus for feeding the middle part of a belt conveyor. Mix & Genest Akt.-Ges. German 507,197.

Bearings for shafts of screw conveyors. Maschinenfabrik Buckau R. Wolf Akt.-Ges. German 506,712.

Elevating conveyor. Adolf Bartels jun, and Ernst Duevel. German 506,714.

Assembly of shaking trough conveyors with bolts. Willi Goering. German 506,716.

Guide for shaking conveyors to prevent cross movement. Schmidt, Kranz & Co. German 506,717.

Apparatus for automatic regulation of the feed in pneumatic conveying installation. Hermann Hartmann. German 507,035.

Automatic latching device of tipping platforms. R. Dolberg Akt.-Ges. German 506,813.

Device for tipping cars. Otto Adolphs. German 506,719.

Boxes for containing and delivering pulverulent or granular substances. G. D. Mackay. British 334,433.

Dumping device for pit cars. Dr. Hans Moeckel. German 507,036.

Mechanically-driven tipping device. Johann Pannen. German 507,037.

Car dumper. Herman Schwarz. German 507,198.

Apparatus for operating bin gates. Elektrowerke Akt.-Ges. German 506,814.

Device for emptying bins. Heymer & Pilz Akt.-Ges. German 506,720.

Track arrangement for traveling cranes. Demag Akt.-Ges. German 506,723.

Screw for emptying pulverulent material from bins, in connection with pneumatic conveyance through pipes, compressed air being led through the hollow screw shaft or its end trunnion. Zeitzer Eisengiesserei und Maschinenfabrik Akt.-Ges. German 507,607.

Rotary car dumper. Link-Belt Ltd. Canadian 304,248.

Washing and Screening

Means for washing, screening and elevating sand and other materials. H. Banks. British 334,371.

Cleaning device for screens. Maschinenfabrik Buckau R. Wolf Akt.-Ges. German 507,101.

PIT AND QUARRY *will furnish, at its actual cost, a copy of any patent cited here. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and readers may procure a copy directly by addressing the Commissioner of Patents, with payment for copies requested. Postage stamps are not accepted by the Patent Office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is there a fixed charge per copy.*

New Corporations

Valley Lime Co., Ltd., Lindsay, Cal. E. H. McEuen, president and general manager, Lindsay; R. L. Rudkin, vice-president, Tracy, Cal.; W. J. Resch, secretary-treasurer, Tracy. Organized to take over Abramson-Bode Corp.

Clarke County Lime Co., Osceola, Iowa. $10,000. E. B. Johnson, president; C. C. Graham, secretary.

Idaho Lime Marble Co., Portland, Ore. $125,000. L. Hahn, Gustaf A. Johnson. Attorneys, Latourette & Latourette, Corbett Bldg., Portland, Ore.

Hodalga Lime Products Corp., Seattle, Wash. $50,000. Howard D. S. Hobson, J. C. Class, S. W. R. Dally.

Connersville Gravel Co., Inc., Connersville, Ind. 750 shares n.p.v. Clyde Piper, Ozro A. Kirkham, Fred Neuman.

Hattiesburg Gravel Supply Co., Hattiesburg, Miss. $50,000. Herbert Gillis, 608 John St.

Strathmann Sand & Gravel Co., Camden, N. J. 2,500 shares com.

Pilot Butte Sand & Gravel Co., Ltd., Pilot Butte, Sask., Can.

Wyckoff Sand & Gravel Co., Wyckoff, N. J. $125,000. J. W. Kehoe and E. A. Kehoe, Paterson, N. J.

Great Lakes Quarries, Ltd., Fort William, Ont., Can. 500,000 shares n.p.v.

Mines Chat Co., Carthage, Mo. $16,000. J. Fred Willingham.

Smithtown Sand & Gravel Co., Smithtown, N. Y. $10,000. C. B. Partridge, Northport, N. Y.

Mica Co. of America, Somerset, Pa. $20,000. A. D. Graham, treasurer.

Valley Sand Co., 209 S. Chilson St., Bay City, Mich. $12,000. Paul E. Carlson, Rudolph R. Luderach, Harry S. Howard.

Pittsburgh Machinery Firm in New Building

The Beckwith Machinery Co., 500 Arch St., Pittsburgh, Pa., on Oct. 20 moved into its new building at 6550 Hamilton Ave. This company is the Caterpillar tractor distributor for Western Pennsylvania and handles auxiliary equipment including the products of the W. K. M. Co.

The new building has a display room with a 204-ft. front and 60 ft. deep. The repair shops and store rooms in the rear are commodious and are equipped for any kind of service that might be required. Offices will be on the second floor.

Legal Information for Operators

Gravel Firm Enjoined in Stream-Pollution Suit

Since numerous sand and gravel firms are thinking of constructing plants whose operation may result in controversy with state, county and city officials over pollution of water in running streams, the recent case of Meriwether Sand & Gravel Co. v. State, 26 S. W. (2d) 57, presents unusually interesting legal information.

The facts of this case are that a part of a gravel company's equipment consisted of railway tracks for the purpose of bringing the gravel in its natural state to its washing plant and delivering it at points where it might be transported to purchasers. A plurality of wells were sunk from which water was procured. The total amount of money expended in erecting and equipping its plant was a large sum. In washing the gravel, the detritus held in suspension by the water flowed across the low-lying ground, and finally was discharged into a nearby stream of water.

The Attorney General filed a suit asking that the gravel company be permanently enjoined from discharging the washings from its gravel beds into the stream on the ground that the same contained fish, and that the operation of the plant had rendered the stream unfit for a spawning and breeding ground, and that the fish had been destroyed and driven from its waters. Also, the water was rendered unfit for bathing.

The counsel for the gravel company argued that depositing in the stream was necessary to successfully conduct its business. In granting an injunction against pollution of the stream, the Court said:

"The water is no longer limpid and pure, but muddy and turbid, to the extent that fish are unable to live there, and those that reach this stream from below must come to the surface to obtain necessary oxygen and, after a time, sink into the water only to die and be cast upon the shore. The pools and lakes in which the urchins and grown folks were wont to bathe are now so discolored and befouled by the foreign matter brought from the gravel plant above and held in suspension in the water that they are no longer clean and clear, but discolor and coat the bodies of bathers with an unpleasant slime. . . . Living water has always been deemed a valuable and desirable thing and, when that is sullied, as in this case, the injury is not slight, but substantial, and of which a Court of equity will take cognizance and remedy by its injunctive power. . . . Neither is the contention that the business engaged in by the appellant (gravel company) is a lawful and useful one proper for the maxim, 'So use that which is thine own as not to injure the rights of another,' applies, regardless of the character of a business."

Cinder Block Patents Are Upheld by Court

In Crozier-Straub v. Maryland Concrete Corp., 39 F. (2d) 126, it was disclosed that a person obtained a patent on a concrete block comprising one-sixth cement, water, and coal cinders or ashes which are first crushed or ground to a consistency composed of pieces not larger than, say, three-quarters inch and retaining all of the smaller sizes and the dust and fine ashes, which are otherwise ordinarily thrown away as refuse. The process of crushing material provides the coarser pieces or lumps of a maximum size sufficiently small to enable the cement to penetrate through their pores and interstices and to bind the entire mass in a homogeneous body.

The inventor claimed that an advantage of the invention is that, owing to the absence of sand or other similar mineral material, the blocks retain the porous, light qualities of the original cinders to a very considerable degree, while at the same time having the necessary strength and resistance to crushing strains.

Another manufacturer attempted to avoid infringement of the patent by using screens to separate the dust from the ashes and then crushing the large particles of clinkers which were then mixed with water and cement to form building blocks.

The patentee sued the manufacturer for damages. The latter contended that no infringement resulted and insisted that the separation of the cinders into two portions, according to size by means of the screen, and the subsequent mingling of equal portions of the fine and coarse material from two bins, distinguishes its process from that of the patent whose specification expressly requires that all of the smaller sizes and the dust and fine ashes shall be used so that the original mass of cinders and ashes, as it comes from the grate, "remains in the resulting mixture without separation or change of proportion."

Notwithstanding this argument the higher Court held the manufacturer liable for infringement, saying: "It seems clear, however, that the mere separation and recombination of the cinders would not of itself constitute a great or substantial departure from the patented process. . . . If the entire mass of material substantially as it comes from the furnace enters into the mixture from which the blocks are formed, infringement *would not be avoided* by merely separating the refuse into two portions, according to size, grinding the coarser material so that the pieces would not exceed three-quarter-inch size, and immediately thereafter recombining the two parts. It would still be true that the original mass would remain in the resulting mixture without real separation or change of proportion, and enter into the finished product."

Quarry Firm Liable If Blasting Causes Damage

It is well established that any person or company performing blasting operations is bound to exercise ordinary care to prevent injury to persons and property. In the late case of Brooks-Calloway Co. v. Carroll, 29 S. W. (2d) 592, the Court clearly explains the legal meaning of ordinary care.

In this case a property owner proved that he had notified the superintendent of a company performing blasting operations that the explosions were damaging his house.

Later, the property owner sued the company for damages and the evidence was conclusive that, as a result of the explosions, the wall of a cistern was cracked so that it would no longer hold water, and the cost of repairing it was a little over $100. The residence itself was much injured. The plastering was so broken and cracked that, to restore the building to anything like its former condition, it would have to be re-plastered. Also, the brick walls were cracked in many places and a builder and contractor who examined the house and described the cracks testified that many of the bricks in the walls were broken, and he estimated the number of broken bricks at 2,500. His estimate, on the repairs, was that the cost would be $3,734.

In view of this testimony the jury held the property owner entitled to recover $2,900 damages, saying:

"It was the duty of the defendant to use ordinary care in doing this blasting to avoid injury to plaintiff's property. . . . Negligence is the failure to use that degree of care which an ordinary prudent man would use under the same or similar circumstances. When Carroll (property owner) notified the company's superintendent that these explosions were injuring his residence, a man of ordinary prudence would have investigated the matter, and would have endeavored to so conduct this work as to avoid inflicting such injuries. Such would have been the course pursued by the average reasonable man of ordinary prudence, and the company will have to suffer as a result. . . . It is no defense that the use of proper care or smaller shots would cause extra labor, expense or delay or diminish the profit of the business."

Insurance Problems Discussed

Plant Safety Practices and Insurance Premiums

No one wants to see a workman injured. At heart all employers and foremen want their men to be healthy, happy and free from worry. Yet it is obvious to any observer of the insurance business that there is considerable disagreement between the safety engineers engaged under workmen's compensation and the managements of the insured plants. It is the strange anomaly of a fight between two parties who should have identical interests.

The trouble does not come from any disagreement over the desirability of safety. It is a widely-accepted fact that the full cost of industrial accidents (including the intangible losses of time of foreman and first-aid man, breaking in a substitute, etc.), amounts to four or five times the annual workmen's compensation insurance premium. The importance of uninterrupted operation is known to everyone.

When a safety recommendation is turned down by a plant owner the reason is almost invariably the same: "The idea is not practical." The proposed safety measure would interfere with the speed of production.

This situation should not exist, and the blame for it lies partly on both sides. There are safety inspectors who make recommendations on snap judgment without thinking through the full effects involved. And there are employers who reject suggestions just because "it never has been done," or because "no young fellow can come into my plant from the outside and tell me how to work a machine that I have been overseeing for twenty years." We cannot deal with the shortcomings of insurance inspectors in this article, because they will not read it. Suffice to say in that respect that the officials of insurance companies are constantly trying to impress on their men that they must not make a safety recommendation unless they personally know that it is mechanically feasible.

Let us, therefore, view the problem solely from the standpoint of the employer or plant owner. When a recommendation comes from the insurance company, it should be looked at in this light: The recommendation almost certainly means that a definite hazard actually is present. The inspector, through ignorance of your business, may not know a good solution. Therefore the plant management should take its letter merely as a statement that a problem exists and if the suggestions will not work, then the company should apply its knowledge to find a scheme that will work.

Safety and production speed are not fundamentally incompatible. So often we hear it said that putting a guard on a certain machine or re-routing material through the plant will slow things up and thereby cost a lot of money. Where you hear that, it simply means that you have not found the best solution. Unsafe operation cannot be cheap or fast. The time lost by accidents, plus the constant fear under which men may work, is so great that safety must be economical. I have seen many cases where an operator resisted guarding a machine on the ground that it would slow up the operation and found out afterwards that, due to these intangible factors, his net production per day was actually increased. And even where facts may sometimes point superficially to leaving some machine unprotected in the interest of speed, usually, if the management will think long enough and hard enough about the problem, it will find some other solution which will not curtail speed and yet will make the lives of its men safer.

Good safety measures increase speed of production. Poor safety recommendations should simply be studied over until they are revised into good ones. That is the essence of the situation.

A safety program starts with the owner or president of the company. It is not enough that he should merely be kind-hearted and say that "of course he does not want anybody to get hurt in his plant." His attitude must be aggressive. He must see that anyone responsible for an accident is properly disciplined, and his daily point of view must be that accidents have to be avoided.

Next in line is the superintendent. It is not much fun to be "hard-boiled" about people who get hurt. Yet the superintendent must be that way if he is going to keep others from being hurt. He must have discipline; he must be willing to discharge a good mechanic or a foreman if the facts should justify such an act in the interest of protecting the other men of the plant.

When the president and superintendent are "sold" on the idea that safety pays, then all they need is the right kind of organization. Safety will not take care of itself. But, with the inspiration of daily interest in the front office, a simple routine system will get the results.

In plants of not more than 150 employees, the safety organization should include a general safety committee, a safety inspector and a bulletin board. The functions of each are sketched out in the following paragraphs, and more detailed information is always available from either your insurance company or your state industrial board. Larger plants may need dispensaries, hospitals or other special equipment, but the essential organization is the same.

There is no such thing as an unavoidable accident. Every time a man gets hurt somebody is to blame. Maybe it was the injured man himself who was careless; maybe the factory teacher did not train him right. Maybe the foreman gave him an ill-advised order. Maybe a neighbor caused the trouble. Or maybe the machine he was working on was imperfect or located in poor light or not fitted for the exact job he was doing. Dig in far enough and you will find that there was someone to blame for every so-called accident that comes along. Somebody could have prevented the injury if he had looked far enough ahead.

The essence of safety organization is to pin the responsibility for every accident on some man or machine. Therefore, as the key to the whole safety program, each plant should have a double card file. Whenever a man is hurt, make out one card for the man and one for the machine, including a description of the accident. If the same man is hurt three times he should be re-educated, shifted to other work, or discharged. No one can afford to keep a man who gets hurt more than three times, no matter how good he is otherwise. If the same machine causes three accidents, call in the department foreman and the superintendent, for something must be done; move the machine to better light, make some alteration in it or put on a guard, or do the work on some safer machine. This card system, if lived up to by the president and superintendent, will give the management complete control over the safety problem.

A bulletin board is of no value unless someone in authority pays attention to it. It will do a lot of good in educating the men if the pictures on it are changed frequently and if the subjects are "live,"—if they depict accidents to which your own men are liable through carelessness.

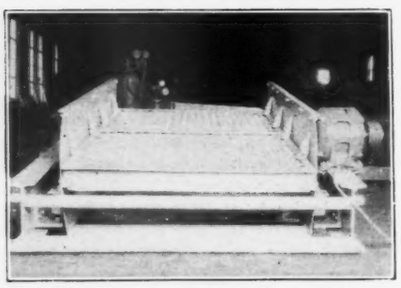
The safety inspector, who makes a weekly round of the plant to see that the guards are on all machines, fire extinguishers in place, and acts as policeman to see that material does not block up the aisles and that men always use gloves, goggles, and other approved appliances need not be a foreman. It is a good rule to assign this job to an older man below the rank of foreman, and pick a new inspector every three months. In this way all the steady men in the plant will get a special training in safety and a nucleus of safety experts in every department will be formed.

New Machinery and Supplies

Vibrating Screen Panel Changed in 22 Minutes

A new vibrating screen, extremely interesting from the operator's point of view, was inspected by a PIT AND QUARRY representative recently. The screen, as the accompanying illustrations show, has the motor mounted at one side, directly on the I-beam frame, a feature which has many operating advantages.

The small illustration shows the eight special clamps which are used to hold down the panels. This permits one man to remove the clamps in a very few minutes and lift out the screen panels undisturbed. According to an actual test, it took the man six minutes to remove the panel, ten minutes for setting in the new screen and another six minutes to fasten the clamps, a total of 22 minutes for making the entire change. This saving in time appears to be one of the biggest money-makers for the operator.

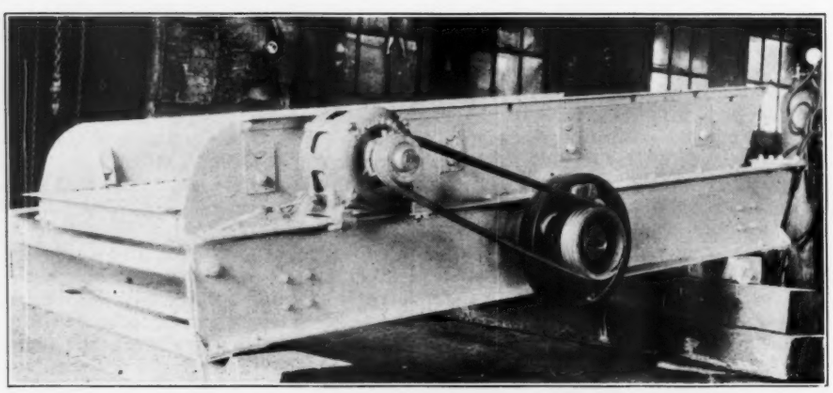


End view of screen. Note eight clamps which hold down panels.

The screen, called the Summit, has been put into production by the J. S. Morrison Co. of Pittsburgh, Pa. The manner of feeding the material to it, too, is interesting. Deck angles are variable, depending upon the nature of the material being sized. On the double- and triple-deck models, baffle plates between decks keep the material thrown back to the head of the decks without loss of any undue amount of space on the screen surfaces.

"We are attempting, in every possible way we know, to build a screen that is ruggedly put together in order to stand the 'gaff' of the severe service the plant operator gives it," J. S. Morrison, head of the firm, declared recently. "And, according to the reports of those who have tried Summit screens in their plants, we feel that we have accomplished considerable in that direction."

Bearings in the Summit screen are self-contained in flanged housings which extend through the I-beam frame. No misalignment is possible and side thrust is thus prevented.



Side view of the screen showing motor mounted on frame.

Differential locomotive dumping a carload of material.

Gasoline Locomotive is Combined with Dump Car

To handle such operations, around quarries and plants, as the switching of empty and loaded cars and the hauling of materials to and from storage piles, a single piece of equipment has been devised. This embodies the functions of both a locomotive and an automatically dumping truck. Such a unit has been placed in service by the National Lime & Stone Co. at its quarry near Lima, O.

The single unit which has been installed to take care of these operations is known as the Differential locomotive and is manufactured by the Differential Steel Car Co. of Findlay, O. The Differential locomotive consists of a locomotive chassis powered with two 155-hp. gasoline engines. Mounted on the locomotive frame is a dump-body of 24-cu. yd. level-load capacity. The locomotive has eight wheels, and each wheel is a driver. The power is transmitted to the wheels by mechanical drive. There are four speeds forward and four reverse. Hyatt roller bearings are used. The dump-body on the locomotive is of unusual design in that the body moves laterally during the dumping operation, thereby discharging the load at a much greater distance from the track. The power for dumping is secured from the gasoline engines which drive the car. The locomotive weighs, light, approximately 36 tons and, loaded, about 76 tons. It is all-steel. It has a cab on one end for the operator and all the locomotive, air brakes and dumping controls are conveniently located in this cab.

Switching with differential locomotive.

The available tractive effort is increased when the car is loaded. This method eliminates placing useless ballast on the locomotive to secure the necessary tractive effort. On return trips when the train is empty, less tractive effort is required. Therefore,

with the locomotive body empty, there is a saving in fuel consumption.

Figures have been compiled for speeds and gasoline consumptions. In seasons when stock-piling has accounted for 40 per cent of the tonnage moved and the delivery of loaded cars to the railroad sidings from both the mill and the storage tracks has accounted for the remaining 60 per cent, 19 tons of stone were handled per gallon of gasoline. Of this tonnage, 60 per cent was moved about 1,500 ft. one way, in railroad cars against grades of 2 to 4 per cent. The balance of the tonnage was loaded upon the locomotive itself and hauled a distance of 2,500 ft. against a grade of from 2 to 4 per cent. There was, of course, considerable switching of empty cars to consume some of the gasoline.

A round trip from the mill to the D. T. & I. R. R. siding requires about six minutes, this being a distance of more than 2,400 ft. A round trip from the mill to the B. & O. R. R. siding, a distance in excess of 3,000 ft., requires from seven to eight minutes. A round trip from the mill to the storage piles, a total distance of 5,000 ft., with time for dumping, consumes from seven to eight minutes.

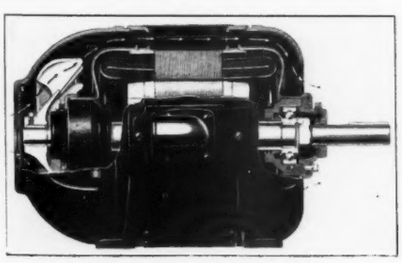
Although the Differential locomotive here described is powered with two gasoline engines, the makers furnish similar units with gas-electric and Diesel-electric drives, and in a variety of sizes.

Enclosed Motors Have External Cooling Fan

The General Electric Co. announces a new line of dust-tight, totally-enclosed, fan-cooled induction motors. These motors are equipped with ball bearings in convenient "cartridge" housings and utilize a single ventilating fan located outside the enclosure proper. They were first exhibited September 22.

A point stressed by the manufacturer is the fact that the new line provides a totally-enclosed motor of the same mounting dimensions, rating for rating, as the standard General Electric open type, horizontal, general purpose motor, from ¾ to 50 hp. in popular speeds.

Size and weight are minimized in the new motors. The single ventilating fan is located outside the motor enclosure on a short shaft extension and on the end opposite the drive end.



Cut-away section showing path of cooling air.

A double frame is used, providing air passages for the ventilating air. All enclosing parts are of substantial steel or cast-iron construction. The fan is housed in a cast-iron enclosure with a heavy screen guarding the large opening for the intake. The air is blown through the ventilation passages and out the drive end.

Any necessary disassembly or reassembly of the motor is facilitated by the simplified mechanical construction. Dust-tight, cartridge type ball bearing housings are a further aid in this respect and permit removal of the rotor without exposing the bearings to dust or dirt.

The motor is endorsed by the Underwriters' Laboratories for hazardous dust conditions specified as Class 2 in the National Electric Code and may be obtained with the Underwriters' label indicating its suitability for such conditions.

Cast Iron Fillers Used in Octagonal Hoppers

Plant operators will be interested in the cast-iron bins, bunkers and hoppers for storage of materials being manufactured by the Treadwell Engineering Co., Hahn Division, Easton, Pa.

Cast iron hopper equipped with loading chutes.

The bins are of sectional construction, the sections being but 5/16 to ⅜ in. thick and cast in either grey iron or steel, depending upon the weight of the material and the loads carried in the individual units. Structural steel members carry the actual load in the bins, the members being placed two feet apart. The cast iron sections are merely fillers between the structural members and hence do not bear the brunt of the load.

The company is now negotiating with several important Portland-cement producers for the installation of the bins as containers for cement clinker.

The bins are constructed either octagonal, semi-octagonal or oblong-octagonal in shape. They may be equipped with bottom-discharge gates and chutes as the accompanying illustration shows.

One of the principal features of the storage bins is the use of the cast-iron filler sections. These sections are not machined, their tough "skins," as they come from the foundry successfully resisting corrosion and abrasion even without protective paint.

New Six-Cylinder Truck Meets a Specific Need

The latest addition to the line of Mack four and six-cylinder trucks is the new Model AK six. Designed for heavy-duty service where greater speed and power is essential, the AK six meets a specific need and does not supplant the present Mack four-cylinder Model AK. It retains the familiar Mack "bulldog-type" hood and is offered with either a covered or coupe type cab.

The new unit is powered by a Mack six-cylinder engine, with bore and stroke of 4½ in. by 5½ in., and develops 126 hp. at 2,200 r. p. m. Pistons are of aluminum, and of the invar strutted type; connecting rods tubular, and the cylinders cast *en bloc*.

Smooth running at all speeds is assured by the use of a case-hardened, drop forged crankshaft which has integral counter-weights and a vibration damper. Valves are flat seated, of L-head type and are located at the right. Lubrication is of the force-feed and splash type.

Transmission has four speeds forward and one reverse and is driven by a single-plate dry-type clutch.

Final drive is by either chain or enclosed gears. The enclosed drive is of the dual-reduction type which has been thoroughly tested in other Mack models. This type of drive is full-floating and each gear assembly is readily and independently accessible without jacking up the axle or disturbing the wheels or brakes. A 45-deg. tilt to the banjo-type axle augments its strength and renders astonishing road clearance compatible with the generous size of gears.

Steering is of the worm-and-nut type. A special steering-knuckle construction greatly reduces steering effort and minimizes the effect of front wheel braking upon the steering. Front axle is of the reversed Elliot type with center-point steering.

New 6-cylinder truck.

Belt-Conveyor Carrier Uses Roller Bearings

A new roller-bearing belt conveyor carrier, known as the Pacific type, has just been developed by the Stephens-Adamson Mfg. Co. of Aurora, Ill. Timken bearings are used throughout and the carrier is featured for use wherever a high-grade conveyor of medium price is wanted.

As the illustration shows, it is of the three-roller, 20-deg. trough design now favored by most engineers. The construction is of heavy-gauge pressed steel, with the single exception of the end stand castings, making the carrier light in weight, strong, rigid and practically unbreakable.

Each roller turns upon two Timken tapered roller bearings housed within an inner hub of steel tubing and well protected from dust and moisture by an intermeshing labyrinth grease seal for each bearing. The tapered roller bearings used are large in size and are arranged to carry end thrust as well as radial loads. The inner hub extends the full length of each roller and prevents any chance for misalignment of bearings. A unique arrangement has been provided for adjusting and setting the bearings for proper clearance. Positive lubrication is insured by an individual Alemite fitting for each bearing.

Each roller, with its bearings, shaft and grease seals, is a self-contained unit that can easily be interchanged with any other roller without disturbing the bearing adjustment. The cross member is a single structural steel angle, formed and punched to eliminate all but one standard pressed steel bracket that is interchangeable for all sizes of carriers. The angle is self-cleaning and eliminates any tendency for material to collect and hinder the free action of the rollers.

In many respects the Pacific type is similar to the Stephens-Adamson Simplex carrier. In announcing this new carrier, the manufacturer states that, in addition to making several improvements, the simplified design of the roller brackets and supports will now make it possible to sell the Pacific type within the medium price range.

The Pacific carrier is built in sizes for conveyor belts from 18 in. to 48 in. wide. The manufacturer further states that clearance dimensions such as backing, bolt spacing and overall dimensions are practically the same as other types of carriers of their manufacture.

Belt conveyor carrier using roller bearings.

Power-Scoop Shovels Do Work of 10 to 15 Men

A new power-scoop shovel designed to handle any loose, fluid material such as sand, gravel, bulk cement, clay or soft coal has been placed on the market by the Clark Tructractor Co., Battle Creek, Mich. It is said to do the work of ten to fifteen shovel and barrow men and do it in less time.

A tractor-powered scoop shovel.

The standard bucket holds 9 cu. ft. or 1,500 lb., though larger capacity buckets are furnished when material to be handled is lighter than sand. Improved hydraulic cylinders enable the driver to pick up and hold the load at any desired point. Re-handling costs are eliminated. The scoop approaches the pile, takes its load and carries it away easily and quickly, dumping it where it is wanted. Two models of different heights are available, one having an under-bucket clearance, with bucket in dumped position of 3 ft. 9 in., and the other of 6 ft. 5 in.

The chassis is a sturdy truck-tractor having a turning radius of only 108 in. Standard truck transmission, multiple-disk clutch and Clark truck axle insure dependable service. Equipment includes starter, generator, battery, head and tail lights. The tractor-type gas engine uses five or six gallons of gas and a pint of oil per day, which means low operating costs.

Develops New Paint to Withstand Weathering

A new product, known as DuLux, which is expected to prove of unusual significance in the paint and varnish business, is announced by E. I. du Pont de Nemours & Co. It is the result of several years of research work on the part of du Pont chemical and technical staffs to impart some of the outstanding advantages of Duco to finishes of the paint and varnish type.

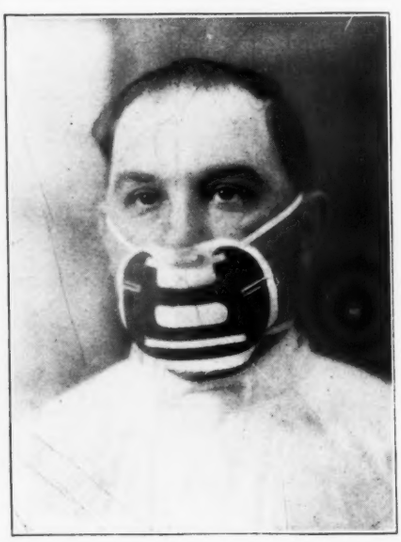
It is stated that the product is based on a new vehicle or film forming material that is a specially developed synthetic chemical compound exceptionally resistant to disintegration, differing radically in this respect from the natural oils and resins generally used in the manufacture of paints, varnishes and enamels.

Its drying time is much shorter than that of ordinary finishes, thus greatly reducing the time during which freshly coated surfaces are subject to marring by insects or dust. It is also unusually resistant to rain damage during the drying period. Exacting laboratory tests have been confirmed by thousands of panels exposed to the elements in various sections of the United States, and indicate that the new product provides surface protection for approximately twice as long as ordinary finishes.

DuLux is now available for industrial uses, including the finishing of machinery and the coating of structural steel, cars and other uses where resistance to weathering and corrosion is required.

Gauze Refills Used in New Prophylactic Mask

A new prophylactic mask, designed to protect workers from breathing disease-producing dust, has recently been placed on the market by the Hubbell Mask Co., 261 West 125th Street, New York, N. Y.



Protective mask using gauze refills.

The feature of the mask is that it contains no unsanitary rubber but, instead, the filtering material is five layers of cotton gauze which is replaced daily. The gauze refills are simply clipped in, assuring the same standard of sanitation and cleanliness insisted upon in hospitals.

The rounded corners of the mask, too, tend to relieve the wearer from eye strain, and, since discomfort is usually the reason why men dislike to wear most types of masks, this new device proves a boon to the wearer.

The Hubbell mask is simply an adaptation of hospital practices to industry. The same principle is used as that in the masks worn by surgeons in the operating rooms to protect them from dangerous gases and disease germs.

Spray Nozzles Increase Production of Screens

Revolving and vibrating screens when equipped with hydraulic spray nozzles not only produce a clean product washed free of overburden, silt, clay balls, and other foreign substances, but the nozzles tend to increase the capacity of the screens. The Binks Manufacturing Co., 3114-46 Carroll Avenue, Chicago, manufacturers of industrial spray appliances since 1898, have recently developed a line of gravel washing nozzles, as illustrated by Fig. 1. Nozzles are constructed of bronze composition metal and made in suitable sizes depending on size of screen operations, water requirements and so forth. Fig. 2 illustrates a typical installation of nozzles in connection with revolving screens, and Fig. 3 shows the same type of nozzle employed in connection with vibrating screens.

Fig. 1. Cut-out view of the nozzle.

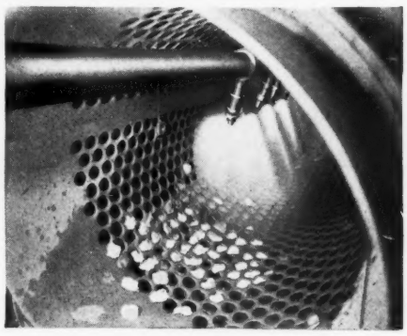


Fig. 2. Spray nozzles in action in revolving screen.

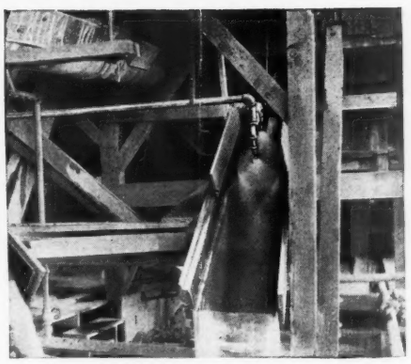


Fig. 3. Spraying material on a vibrating screen.

Nozzles are designed with a stationary internal two-vane helical core which sets up a tremendous velocity within the whirl chamber and discharges a full mass spray of equal density throughout the entire cross section of the spray cone, which fully penetrates all material under which nozzles are directed.

Descriptive bulletins will be furnished by the company on request.

Book Review

INTRODUCTORY ECONOMIC GEOLOGY, by *W. A. Tarr*, Ph. D., Sc. D., professor of geology and mineralogy, University of Missouri. McGraw-Hill Book Co., New York, N. Y.

This is the first edition of a textbook which presents a general picture of the earth materials used by man. Only the most common minerals are considered and, although some knowledge of geology is presupposed, the material is written for the layman. The book comprises three parts—History and Origin of Earth Materials, Metallic Earth Materials, and Non-Metallic Earth Materials. The first section discusses the uses to which minerals were put by prehistoric races, leading down to the utter dependence of our modern civilization upon earth materials. The general principles of the formation of mineral deposits are covered by a large chapter.

One portion of this book that is of special interest to readers of PIT AND QUARRY is the chapter devoted to structural materials in the third part. Here are given statistical and technical discussions of cement, stone, sand, gypsum, lime, slate and miscellaneous non-metallic minerals.

Statement of Ownership

PIT AND QUARRY

Statement of the ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912, of PIT AND QUARRY, published bi-weekly at 538 S. Clark Street, Chicago, Ill., for October 1, 1930.

State of Illinois, County of Cook, ss.

Before me, a notary public in and for the state and county aforesaid, personally appeared H. W. Baumgartner, who, having been duly sworn according to law, deposes and says that he is the publisher of PIT AND QUARRY, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse side of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Complete Service Publishing Co.; Editor, S. A. Phillips; Managing Editor, A. J. Hoskin; Business Manager, V. E. Larsen, all of Chicago, Ill.

2. That the owner is Complete Service Publishing Co., Chicago, Ill. That the stockholders owning 1% or more of the total amount of stock are: H. W. Baumgartner, I. A. Baumgartner and V. E. Larsen, all of Chicago, Ill.

3. That there are no bondholders, mortgagees, or other security holders owning or holding 1% or more of total amount of bonds, mortgages or other securities.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest, direct or indirect, in the said stock, bonds, or other securities than as so stated by him.

H. W. BAUMGARTNER,
Publisher.

Sworn to and subscribed before me this 1st day of October, 1930.

(Seal.) M. J. STANTON.
Notary Public.

My commission expires Dec. 8, 1930.

Manufacturers' Publications

Each publication listed below contains information of interest to nonmetallic mineral producers. Readers may obtain, without charge—except where a price may be stated—and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention PIT AND QUARRY *when writing.*

Boilers

Stoker-Unit Firebox Boilers. 6 p., 3 ill. (Bulletin SU-3. Oil City Boiler Works, Oil City, Pa.) Describes and illustrates stoker-unit boilers ranging in size from 75 to 300 hp. with working pressures from 0.15 to 125 lb. Either riveted or welded construction is offered.

Chain

Silent and Roller Chain. 124 p. Illustrated. (Catalogue No. 200. The Union Chain & Mfg. Co., Sandusky, O.) A new catalogue and treatise on high-speed power transmission with silent and roller chain. Includes valuable engineering data and tables. Will prove a desirable addition to the files of any operating plant.

Compressors

Two-Stage Air Compressors. 8 p., 10 ill. (Bulletin No. 153. Pennsylvania Pump & Compressor Co., Easton, Pa.) Describes and illustrates a line of two-stage air compressors of the straight-line, tandem type. *Bulletin 151* by the same concern describes and illustrates both air and gas compressors.

Conveyors, Steam-Jet

Hahn Steam-Jet Conveyors. 32 p., 57 ill. (Catalogue No. 100. Treadwell Engineering Co., Hahn Division, Easton, Pa.) Describes and illustrates steam jet conveyors for the handling of abrasive materials.

Dredging

"Manor Lake Extends Its Shores." 4 p., 4 ill. (*The Warner-American News* for September, 1930. Warner Co., Philadelphia, Pa.) Describes and illustrates the opening up of new sand and gravel deposits on the old government arsenal property located near Morrisville, Pa. The operation of electric dredges described.

Drilling

"Progress in the Art of Sharpening Bits." 2 p., 1 ill. (*The Armstrong Driller* for September, 1930. Armstrong Manufacturing Co., Waterloo, Ia.) Describes and illustrates the advancements made in modern bit dressing by the use of machinery as compared with hand methods.

Electrical Equipment

Trumbull Cheer for September, 1930. 16 p. (The Trumbull Electric Manufacturing Co., Plainville, Conn.) Lists a wide variety of switches and other electrical equipment for plant use, giving prices, capacities, and descriptions.

Fabricated Steel

Standardized Service in Steel for One-Story Buildings. 12 p., 35 ill. (Catalogue No. 618. The Macomber Steel Co., Canton, O.) Describes and illustrates the construction of industrial buildings with standardized steel roof trusses, framing, floor joists, roof decking, siding, lath, windows, and doors.

Machinery, Used

Bulletin No. 410. 2 p., 2 ill. (W. A. Zelnicker Supply Co., St. Louis, Mo.) Lists a variety of second-hand cranes, engines, tanks, and other equipment for use in the pit-and-quarry field.

Metal Cleaning

The Industrial Cleaning of Metal. 40 p., 13 ill. (The J. B. Ford Co., Wyandotte, Mich.) Describes and illustrates the methods and chemicals used in cleaning oil, grease, and other dirt from machines and other metallic surfaces in industrial plants.

Motors, Induction

Burke S and SV Induction Motors. 8 p., 14 ill. (Burke Electric Co., Erie, Pa.) Describes and illustrates the types, ratings, design, and construction of the induction motors made by this concern. Installation views are also given.

Motors, Synchronous

G-E Synchronous Motors for Pumping. 4 p., 7 ill. *G-E Super Synchronous Motors.* 4 p., 5 ill. (General Electric Co., Schenectady, N. Y.) Describe and illustrate the application of the synchronous motor to pumping and to large grinding and pulverizing mills.

Hytork Synchronous Motors. 12 p., 12 ill. (Bulletin No. 1150. Allis-Chalmers Manufacturing Co., Milwaukee, Wis.) Describes and illustrates the application of a synchronous motor, designed to combine the starting characteristics of the ordinary slip-ring induction motor with the running characteristics of the synchronous motor, in cement mill operation. High starting torque with minimum current from the line features this motor.

Shovels

"The Story of Progress." 4 p., 6 ill. (*The Ground Hog.* [46th Anniversary Number] for September, 1930. The Marion Steam Shovel Co., Marion, O.) Tells, in an interesting manner, the story of a great shovel manufacturer's part in the important industrial development of the past half century. A deluxe edition bound in leather-like covers, of the company's house magazine.

Storage Containers

Hahn Sectional Cast Iron Hoppers —Tanks—Bunkers. (Bulletins 12, 14, 15 and 16. Treadwell Engineering Co. Hahn Division, Easton, Pa.) Four six-page folders which describe and illustrate cast iron containers for the storage of sand, gravel, stone, cement-clinker, and other pit-and-quarry materials and products.

Trailers

Athey Truss-Wheel, 3-Way Dump Trailers. 8 p., 14 ill. (Bulletin No. 102-A. Athey Truss-Wheel Co., Chicago, Ill.) Describes and illustrates a dump trailer which dumps from the rear or either side and mounted on track-laying wheels. (Bodies are by the Commercial Shearing & Stamping Co., Youngstown, O.)

Washing

Binks Spray Nozzles for Sand and Gravel Washing. 4 p., 8 ill. (Binks Manufacturing Co., Chicago, Ill.) Describes and illustrates a spraying nozzle for the efficient washing of sand and gravel, showing its application to revolving and vibrating screens. Atomizing nozzles for laying dust in cement and crushed-stone plants are also shown.

Welding

Burke Arc Welders. 8 p., 9 ill. (Burke Electric Co., Erie, Pa.) Describes and illustrates the design, construction, and ratings of portable arc welders, one of the products manufactured by this firm. Others are motors, motor-generator sets, connectors, and wall-and-floor bushings.

Weldite Green Surfaced Welding Rods. 6 p., 1 ill. (Fusion Welding Corp., New York, N. Y.) A folder describing a new development in mild steel welding rods. The rods are surfaced in a bright green covering which stabilizes the arc and reduces spluttering and loss of electrode metal.

Detroit Manufacturer Opens Five New Offices

The Palmer-Bee Co., Detroit, manufacturers of conveyors, speed reducers, flexible couplings and other plant equipment, announces the opening of the following district offices: Buffalo, N. Y., Ellicott Sq. Bldg., E. C. Jeremias, Manager; Pittsburgh, Pa., Farmers Bank Bldg., C. E. Musselman, Manager; Cleveland, O., Rockefeller Bldg., F. B. Barkwill, Manager; Winston-Salem, N. C., Reynolds Bldg., E. S. Davidson, Manager; Philadelphia, Pa., Bulletin Bldg., S. T. Transeau, Manager.

New Portable Conveyor for Bessemer's Quarry

A piece of interesting equipment—a new stacker, or portable belt conveyor—has been designed and completed for the Bessemer Limestone & Cement Co. of Youngstown, O., by the F. M. Welch Engineering Service of Greenville, O. It is said to be the largest stacker or portable belt conveyor ever built. It consists of a 48-in. conveyor at 220-ft. centers and is used for depositing over-burden that has been excavated by steam shovel into the quarry. The entire machine required seven railroad cars to make shipment.

What the National Safety Council Is Doing for the Members of Its Quarry Section*

By J. V. SCOTT
Director, Service Extension

WHAT is the National Safety Council doing for the Quarry Section? Theoretically, this question can be answered only by giving the answer to another question, "what is the Quarry Section doing for itself?" The co-operative organization of the Council provides that its members work together upon a reciprocal basis, help one another, and through the exchange of ideas and experience, prevent accidents in individual operations and in the industry as a whole.

In the 18 years that have elapsed since the Council was formed, it has grown from a swaddling infant of a few dozen members to a mighty, international organization of 5,500 companies in every nation of the world. Ten million workers today are being taught higher standards of safety and health through the organized instruction of the Council. Consequently, safety has advanced from the stage of abstract theory to a highly specialized business that absorbs the time of thousands of safety engineers and executives. And with this progress, the National Safety Council has accumulated data and experience that are invaluable to any company or to any industry that becomes convinced that accidents can and must be stopped.

At the Annual Safety Congress five years ago, a Quarry Section was organized. A few pioneers who at that time were members of the Cement Section, blazed the new trail. The cement industry had enjoyed real success in reducing accidents, for with virtually every cement plant in the nation a member of the Section, this industry has established a phenomenal record of an 83-per cent decrease in accidents during a ten-year period. The quarry operators decided that quarry accidents could be stopped, too, and the Quarry Section came into being.

The faith of this little group of pioneers was not misplaced. While it is my purpose to discuss the present and future of the Quarry Section's activity, permit me to complete my introductory thought with a mention of the results of five years of safety work.

I am told that half of the quarrymen in the country are employed by companies holding membership in the Council and the Quarry Section.

THE 1929 accident records of 125 quarries reported to the U. S. Bureau of Mines indicate fewer lost-time accidents in the industry, on the basis of exposure, than during any of the previous three years. The 1929 accident-frequency rate of these establishments indicates a decline of 9 per cent over the 1928 rate, and a 38-per cent reduction over the 1926 rate for the industry. The accident-severity rate, while higher fractionally than either the 1928 or 1927 rates, was 21 per cent lower than the 1926 rate.

With 10 per cent fewer fatalities and 20 per cent fewer injuries in the industry in this brief period, it is apparent that the organized safety work being done by the Quarry Section is showing results. Since the Section was formed five years ago, quarry accidents have been reduced 40 per cent in number, and days lost from accidents have been cut 20 per cent.

Throughout this period, the National Safety Council has helped the Quarry Section by serving as its clearing-house. The experience of two decades of accident-prevention effort in all industries has been compiled by Council engineers and librarians and has been placed at the disposal of the Section. One of the first steps taken to encourage the Section to conduct research into quarrying hazards and methods of overcoming them was the publication by the Council of the Safe Practices Pamphlet "Safety Organization for the Quarry Industry." Long before the demand justified their production, the Council issued specific quarry posters. A monthly News-Letter was authorized for the Section, and, through this medium, members have been able to exchange ideas and information supplementing their annual sessions at the Congress. The proceedings of these meetings have likewise been published, and every effort has been made to record the experience of the Section during the early years. Working in close co-operation with the National Crushed Stone Assn., a vigorous effort has been made during the present year to bring every American quarrying company into the Council and the Section, to concentrate the safety work of the industry.

It is my pleasure to report a splendid response by the industry to this effort. In January I attended and addressed the National Crushed Stone Assn. convention. At that time, the membership of the Section was approximately 70. Today it has more than 100 members, the largest rate of growth of any of the Council's 30 industrial sections during 1930. In view of none-too-thriving business conditions, this increase—more than 30 per cent—reflects an aroused interest in safety in the industry and promises real support for the program ahead of the Section.

THE National Safety Council has helped the Quarry Section perfect an active, working organization. Every possible aid has been afforded. Because of the Council's non-commercial structure, with every penny of revenue going to provide our regular service, no profits are accrued to permit specialized service. But I am convinced that the Quarry Section is well on its way to success. Sufficient momentum has been gained during the first five years to insure rapid strides forward in the next few years. I look for real accomplishments by the Section in the coming year.

I spoke of the Section's program. Many improvements in the service are scheduled. I understand four quarry Safe-Practices Pamphlets are being considered. Their tentative subjects are "Safe Practices in Sand-and-Gravel Excavation," "Safe Practices in Clay-and-Shale Digging," "Safe Practices in Monumental-Stone Work," and "Safe Use of Explosives in Quarries." Incidentally, the Cement Section is now completing its fourth Safe Practices Pamphlet of its new series of seven; the subject is: "Cement-Rock Quarrying and Crushing."

These pamphlets will take their place in the series of 125 Safe Practices Pamphlets which have been issued by the Council in collaboration with the Safe Practices Conference Committee of 75 safety engineers and the executive committees of the several sections.

The new "Manual for Quarrymen" also should come from the press during the coming year, and I understand a quarry motion-picture film is being considered. This program may well be termed ambitious. Its success depends almost entirely upon the support of the members through participation in the Section's activities. I urge you to contribute ideas and opinions to the monthly news-letter, to make it a real forum of quarry accident-prevention problems. Help develop the service—contribute photographs to the Council's poster department and the National Safety News—report safety discoveries and news to the Council's engineers and library—recommend to quarries not in the Section that they put their shoulder to the wheel by becoming members of the Council—put real fire into your individual safety programs and by successful results, influence less interested people in the industry to take an active part in safety promotion.

* Presented at the Quarry Section, National Safety Congress, Pittsburgh, Pa., Oct. 2, 1930.

IT is simpler to define than execute, the way in which the Quarry Section can achieve outstanding recognition for safety. A word answer is: *Work!*

I want to emphasize however, the value of using the Council's safety engineering consultation service, the industrial health consultation service, the million-dollar library at headquarters, the numerous publications and supplementary services. The Council is a great clearing house of safety information, and there is an answer for your every question—if you will but ask it! Begin now to call upon our headquarters for help, form a direct working contact if you have not already done so, and make full use of the extensive service that is yours. What the National Safety Council does for the Quarry Section depends, as I have said, upon what the Section will do for itself and how much you will avail yourself of the aid awaiting you.

Pumpings from the Old Pit

Excerpts from the old files of PIT AND QUARRY *reveal many interesting sidelights on the activities of the pits, quarries and plants of former days. These, interesting by comparison with practices in vogue today, are printed in this column each issue.*

▲ *Fourteen Years Ago* ▲

Just fourteen years ago the first number of the first periodical to be devoted particularly to the interests of producers of non-metallic minerals made its public appearance. No. 1 of Vol. 1, PIT AND QUARRY is dated October, 1916.

Because there are many operators who were then active in the production of these minerals, a few items from that first issue are repeated here. Not only should these items prove of interest to such men but they will probably provide the later generation of operators and employees some degree of perspective in the industry.

The leading editorial was headed "Some Good Reasons" and explained that "producers have in the past found it necessary to be content with such space as was given them in journals impinging to a limited extent on their field. This has been most unsatisfactory from the standpoint of the reader and the advertiser, until the time has arrived when, in the rapid growth of the industry, a publication like PIT AND QUARRY is absolutely demanded. The phenomenal increase in the use of concrete for all classes of construction has given a wonderful impetus to the business of the men who own and operate pits and quarries. Think, for a moment, that at the present rate of consumption of cement in this country, at least 60,000,000 cubic yards of aggregates must be produced annually for concrete work alone.

"PIT AND QUARRY is the response to the demand of this industry. Its sole purpose is to give the men in the sand, gravel and stone business a specialized publication, all of it devoted to their interests and taking up their problems in a detailed way which would not be possible for publications having other interests to serve; and also to furnish to advertisers a direct medium for reaching these men without having to pay for a large amount of waste circulation."

The following was directed to manufacturers of equipment:

"This one publication will allow you to cover the field completely, at a moderate rate, in place of the incomplete and expensive distribution you are probably getting by advertising in several journals, each of which may partly cover the industry.

"Put your message to these men in PIT AND QUARRY and rest assured that it will get across. The very man you want to reach is on our mailing list. He will hear from you just as certainly as though you sent him a telegram. If your message has punch in it, you will hear from him."

▲ ▲ *Ten Years Ago* ▲ ▲

In the October, 1920 issue, Daniel J. Hauer traced the progress that had been made during the preceding decade in mechanization of pits and quarries, showed how electricity was superseding steam in this development, and gave reasons therefor. According to the writer, the use of electrical power avoids long steam lines, renders the transmission of power most flexible, is not affected by climatic conditions, permits use of lighter units which are more portable in pits and quarries, eliminates objectionable exhausts and smoke, and saves labor in starting and banking furnace fires. The article, entitled "Electricity in Pits and Quarries" was the first in a series on this general subject.

* * *

V. O. Johnston, president, and E. Guy Sutton, business manager of the National Assn. of Sand and Gravel Producers, visited the leading cities of the South as part of a plan to cover the entire country before the next annual meeting.

* * *

The South Ottawa Silica Sand Co. opened a new pit at Ottawa, Ill., and was using a Barber-Greene dragline and conveyor to excavate 40 ft. below ground level. A 50-ton car could be loaded in one hour.

* * *

J. E. Slipher of the National Lime Assn. discussed "Lime as a Potent Factor in Good Tilth." He stated that the application of lime for agricultural purposes renders the soil more permeable for root growth, permits the ready reception of rainfall, guarantees an ample supply of air for root and bacterial growths and makes tillage less expensive but more effective.

* * *

"Our Washington Correspondent" reported that unless Congress should make an appropriation during the next fiscal year for Federal aid in road building the resulting uncertainty would cause the entire road-building program to suffer a serious setback.

▲ ▲ *Five Years Ago* ▲ ▲

In an article entitled "New Standard Gypsum Plant at Seattle," E. D. Roberts described the operations and equipment of the Standard Gypsum Co.'s new two-kettle plant on Harbor Island, Seattle, Wash., which utilized rock from the Island of San Marcos in the Gulf of Lower California.

* * *

Plans had been completed by the National Crushed Stone Assn. for the establishment of a Bureau of Engineering in Washington, D. C., and A. T. Goldbeck, then chief of the division of tests of the U. S. Bureau of Public Roads, had been selected as the Director. The office of the secretary was transferred to Washington from Columbus, O., and placed in charge of J. R. Boyd, newly appointed.

* * *

F. F. McLaughlin, blasting engineer for the France Stone Co., discussed the use of explosives in quarries, asserting that there is no such thing as a "safe" high explosive.

* * *

"Economies in Lime Manufacture" was discussed by F. A. Westbrook in an article about the Mississquoi Lime Co. of High Gate, Vt. This company made chalk as well as lime.

* * *

L. M. McDonald, superintendent of the Canadian Cement Co., told how Plant No. 8 went 340 days without an accident.

* * *

The quarrying, manufacture and use of gypsum was explained by George O. Gray in a paper read before the Seattle Mining Club.

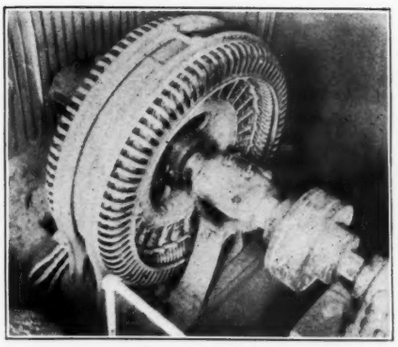
* * *

Succeeding issues of PIT AND QUARRY will contain additional items from its old files.

Motor Functions Well Despite Abrasive Dust

The photograph shows a 100-hp. synchronous motor, built by the Electric Machinery Mfg. Co., operating under the extremely adverse conditions of a rock-dust atmosphere at the plant of the Funkhouser Co., in Charmian, Pa. The motor, which has been in operation practically all the time since its installation, drives, through a line shaft, three 30-in. by 16-in. balanced Sturtevant rolls.

The rock dust, which has an exceedingly abrasive and clogging action, is the result of grinding stone for use on



Synchronous motor which drives roll crusher.

prepared shingles for homes and buildings. Under dusty conditions such as these, the large air-gap, inherent in synchronous motors, is quite advantageous as it permits satisfactory operation with a minimum of maintenance. In addition to this, the synchronous motor operating at either unity or leading power-factor, can aid considerably in correcting the plant power-factor. At this installation it helps the Funkhouser Co. to avoid the penalty for low power-factor.

Aluminum Proves Worth as Truck-Body Material

In the fall of 1928, the Pittsburgh Coal Co. purchased from the Auto Truck Equipment Co., Pittsburgh, an aluminized high-lift dump truck. The body of this truck, as well as the hoisting mechanism arms and frame, were fabricated from the strong aluminum alloys. The dimensions of the body are 2 ft. 6 in. by 6 ft. 9 in. by 9 ft., with an 8-in. flare. The gross weight of the body and hoisting mechanism was 1,800 lb. less than the gross weight of a similar body built entirely of the heavier materials.

This initial aluminized unit of the Pittsburgh Coal Co. has carried approximately 4,000 loads of coal averaging more than 5 tons to the load. The truck has been operated nearly 30,000 miles. Coal is dropped into the body of the truck by gravity from overhead bins. These bins are 6 ft. above the floor of the truck.

Truck in position to receive its load from bin.

The strong aluminum-alloy body has stood up exceedingly well. The 0.182-in. floor shows a few small dents and a sag of only ⅝ in. between two of the cross members. Between the other cross members the floor shows no sag. The sag in the floor occurs at the point where the coal first comes in contact with it during the loading operation. The sides of the body show no wear.

This truck of the Pittsburgh Coal Co. was the first to have an all-aluminum body. While the strong aluminum alloys represent a development of more than ten years ago, their somewhat higher initial cost undoubtedly had a great deal to do with retarding their use in truck-body construction. But once they were employed, it soon became apparent that the additional cost could be written off in a very short time.

The strong aluminum alloys weigh only one-third as much as the other metals commonly employed in truck bodies, and as a result, the gross weight of a truck with an aluminum body is much less than that of a truck with a body fabricated from other materials. This decrease in body weight is utilized in increasing the payload of the truck or in decreasing its dead weight. In either case the operating costs are less.

The Pittsburgh Coal Co. has been so well pleased with the performance of this high-lift truck that its fleet now includes 18 trucks with aluminum bodies. Graham Brothers, Inc., Long Island, Cal., has approximately 25 aluminized trucks in which it hauls rock and sand. The Manegold Stone Co., Milwaukee, also employs trucks with aluminum bodies for the same type work. The Wisconsin Ice & Coal Co., Milwaukee, the Fuller Coal Co., St. Louis, and the Seaconnet Coal Co., Providence, have materially increased the payload of their trucks by the use of aluminum. The 16-cu. yd. truck of the Seaconnet Coal Co. is the largest coal truck operating on the highways today.

The first high-lift truck with an aluminum-alloy body.

Fuller Lehigh Co. Now Located in Carew Tower

According to a recent announcement, the Fuller Lehigh Co., Fullerton, Pa., announces the removal of its Cincinnati office from the Traction Building to Carew Tower, Cincinnati, O. H. E. Martin will continue in charge as manager.

Solving the Water-Pumping Problem in the Gravel Pit or Quarry

In the gravel pit the water-pumping problem is to get enough water and in the quarry it is to get rid of the water quickly. For the pit there are at least three methods of getting the individual supply, according to H. L. Miller, president of the Luitwieler Pumping Engine Co., Rochester, N. Y. These are:

(1) Suction pump from open stream or river. (2) Suction pump from pond, lake or impounding reservoir. (3) Sub-surface supply from bored wells.

There are some disadvantages in the first and second methods, such as drying up of streams in summer, frost conditions in winter, and flood conditions and outgoing of ice in spring which is expensive in maintaining suction lines in open streams.

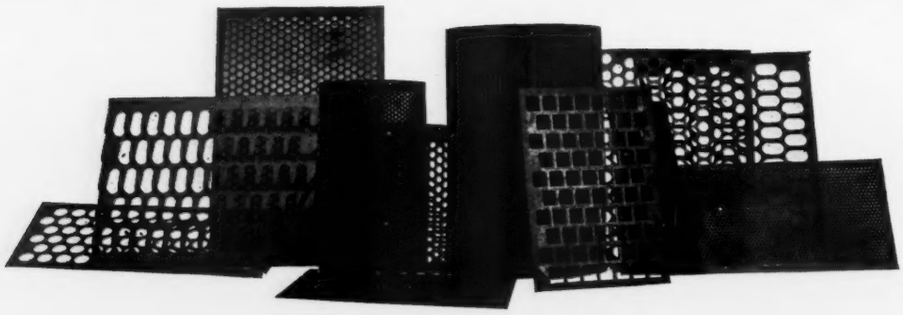
The third method, using the bored well, is the most dependable at all times, undisturbed by winter operations and free from the annual loss from flood conditions of open streams in spring. As to capacity this varies with the requirements all the way from 400 gal. per min. to 1,200 gal. per min. or more.

"I have in mind one gravel pit where the annual repairs from flood damage amounted often to $1,500 a season," declares Mr. Miller. "With the installation of an 8-in. bored well we are now pumping 850 gal. per min., at a cost of about $1 per hour night or day, winter or summer, with only nominal maintenance expense and no repairs or damage from weather or flood conditions.

"In general the individual well is more dependable for capacity also.

"The same type of large capacity, vertical, automatic turbine pumps can be used to advantage for unwatering quarries. The pumps and motors are both vertical, adjustable, self-contained, automatic and require no oil lubrication, therefore requiring only nominal attention, being controlled by the tower man with a push-button starter.

"This method solves the water problem of the pit or quarry and will last almost indefinitely."



For Best Results Use the Morrow!

THE Morrow Perforated Metal Screens for sizing and preparing coal, sand, gravel, stone, and other bulk materials are made by a company specializing in screening machinery.

Behind our recommendations to you lies years of experience which has taught us the best line of screens to use for a given work.

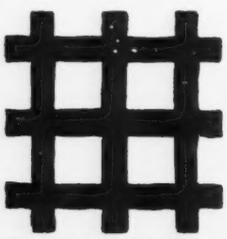
You are offered such sizes and shapes of perforations which we know to be best suited to the screening of bulk materials.

If our wide stock does not suit your particular purpose, we will make special plates to your specifications. Our factory is equipped to roll or flange plates to order, and will punch marginal holes as directed.

Write for full particulars.

THE MORROW MFG. CO. QUALITY MORROW SERVICE WELLSTON - OHIO

40 Mesh; .0135 Wire



2½ Mesh; .105 Wire

12 Mesh; .047 Wire

SERVICE!

is the one thought behind every operation in the manufacture of—

"CLEVELAND" Double-Crimped Wire Cloth

Uniform fineness and long service will be assured by its use in screening SAND, GRAVEL, CRUSHED STONE AND CEMENT.

Large stock always on hand; special mesh manufactured to suit requirements at right prices

THE CLEVELAND WIRE CLOTH & MFG. CO.

3579 East 78th Street, Cleveland, Ohio

HAND OPERATED STEEL PULLER
FOUR PAWL ROTATION

MODEL 11
HAND
HELD
DRILLS

A light sinking drill of advanced engineering design with an exceptional performance record. Weighs only 50 lbs.

RENEWABLE CHUCK
DRIVER
POWERFUL BLOWING

GARDNER-DENVER COMPANY
QUINCY, ILLINOIS
Branches In All Principal Cities

GARDNER-DENVER